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ECONOMIC RESEARCH SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

CURRENT PROGRAM
and
PROGRESS REPORT

of the

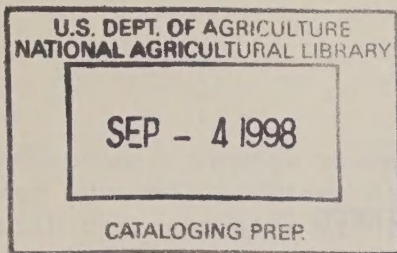
FARM PRODUCTION ECONOMICS DIVISION

Fiscal Year 1970

**United States
Department of
Agriculture**



National Agricultural Library



PREFACE

This progress report is primarily a tool for use of scientists and administrators in program coordination, development and evaluation. The summaries of progress include some tentative results that have not been tested sufficiently to justify general release. Such findings, when adequately confirmed, will be released promptly through established channels. Because of this, the report is not intended for publication and should not be referred to in literature citations. Copies are distributed only to members of Department staff and others having a special interest in the development of public agricultural research programs.

This progress report was compiled in the Farm Production Economics Division, Economic Research Service, U. S. Department of Agriculture, Washington, D. C. 20250.

November 1970

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INTRODUCTION

Farm production economics research, as used in this report, deals with many and varied economic problems of agricultural production. The work is concerned with the economics of organization and management of farms and the agricultural supply industry, use of capital and labor in agriculture, adjustments in production and resource use, problems of pesticides use and animal waste disposal, and appraisal of alternative production policies and programs. First priority attention is given to those problems with nationwide, regionwide, commodity-wide or resource-wide implications.

A continuing problem in agriculture is the adjustment of production, both in the aggregate and for major commodities, to market needs. Achievement of economic balance in agriculture and adequate returns to farmers are likely to continue to be difficult as we strive to match the capacity of agriculture to produce with the food and fiber requirements of a larger U. S. population and export markets for farm products. Farms are decreasing in number and increasing in size and degree of specialization. Farm machinery, fertilizer, and other innovations, are substituting for land and labor. Coupled with rising farmland values, these developments necessitate large and increasing capital investments per farm, and alter farm credit and insurance needs. Increasing dependence on purchased inputs and on cash markets for products make net income increasingly vulnerable to changes in prices of both inputs and outputs. These trends together with increasing concern about the effects of agricultural production on the environment and emerging problems in farm labor challenge the most rigorous research in the field of farm economics. Results of research in this field are widely used as guides to management and policy decisions at the farm, area, regional, State, and national levels.

The Department's program of research and related statistical reporting in farm production economics is conducted from headquarters in Washington, D. C., and is concerned chiefly with problems of regional and national scope. Members of the Division's Field Staff are stationed at 30 State agricultural experiment stations. Field studies generally are conducted in cooperation with State experiment stations. When studies are made jointly by Federal and State workers, Federal people usually are most interested in regional and national applications and results, while State workers are most often interested in local applications. Close working relationships between Federal and State agencies have long been traditional in this field. This close cooperation in planning and conducting the work reflects joint and cooperative efforts rather than overlapping or duplication of effort.

The farm production economics research program is covered under 9 area headings shown in the Table of Contents. More detailed subject-matter subheadings are given in the discussion of each area of work.

During the year covered by this report, the special policy and program contributions that the Division has been able to make have been significant. Division personnel have responded to many requests for assistance from the Office of the Secretary, program administrators, Members of Congress, and others. In addition, many of the Division's continuing statistical series and analyses have become increasingly important in efforts to understand changes and achieve improvements in the structure and in the well-being of American agriculture.

AREA NO. 1. AGRICULTURAL ADJUSTMENTS

Problem. A continuing problem in agriculture is to adjust production, both in the aggregate and for major commodities, to market needs. Achievement of economic balance in agriculture and adequate returns to farmers are likely to continue to be difficult in the next 5 to 10 years as we strive to match the capacity of agriculture to produce with the food and fiber requirements of a larger U. S. population and export markets for farm products. Adjustment problems vary by major commodities, by farm type, and among farming regions. Excess capacity continues to be a major problem for crops such as cotton, wheat, and feed grains. In contrast projected requirements for livestock products, particularly beef, indicate the need for a significant increase in production over the next 10 years. Continuing studies are needed which evaluate profitable and expected adjustments for individual farmers and for major sectors of the industry and provide necessary background data and information for aggregate analyses of national production and supply response.

OBJECTIVES -- USDA AND COOPERATIVE PROGRAM

The program encompasses analysis of the major crop and livestock commodities produced in the United States including wheat, feed grains, cotton, rice, tobacco, peanuts, beef cattle and dairy. Studies are conducted in the major production areas and regions throughout the country. Broad objectives of the research are to evaluate the impact of adjustments in farm production and resource use on farm income, the structure of agriculture, and regional and national production of major commodities. Analyses consider needs for adjustment and profitable and expected adjustments to changes in technology, product prices, costs of inputs, farm programs, and other factors influencing production response.

PROGRESS -- USDA AND COOPERATIVE PROGRAM

A. Appraisal of Adjustments in Feed-Livestock Areas

An economic appraisal of the cattle feeding industry in the United States continued. Identification of recent trends and the current status of the industry was completed for the nation and for some of the chief beef producing regions. Major shifts include steady growth in both total and per capita consumption of beef, feedlot finishing of a higher proportion of young cattle, including dairy stock, growth of commercial feedlots to a position of handling nearly half of all fed cattle even though they account for less than one percent of the feedlots, a sharp increase in custom feeding especially in areas of rapidly expanding commercial feedlots, and a change toward direct marketing from feeder to packer. Imports of live feeder cattle, beef, and beef products occurred to a small extent, but the industry remains largely domestic.

Expansion of beef production resulted largely from an average annual increase of one million cows from 1950 through 1969, and the shift of nearly all young cattle to feedlots before slaughter. The burden of supplying an estimated one-third more beef by 1980 places a major burden on resources to carry more beef cows and the productivity of these cows.

In Arizona, data on live cattle movements into and out of the State by counties and types of cattle were summarized for 1960-68. Work is underway on projected cattle feeding by regions of the U. S. for 1980.

In Texas, an intensive study of the ownership and financial structure of feedlots is underway. Both feedlots and lending institutions will be surveyed. Emphasis is being placed on commercial operations as their methods of operation and financial strength will likely affect developments in the entire industry.

In South Carolina, researchers cooperated in surveys of beef producing farms for 37 subregions of the southern and southeastern states. Representative resource situations are being developed for each subregion. These data will be used as the basis for interregional analyses with emphasis on the effect of the recent growth and future potential for production of feeder cattle in the region.

In North Carolina, a summary of characteristics and trends of beef cattle production in the Southeast gave the first comprehensive view of the industry in the region. Progress was made in the development of decision models for use in analyzing optimum enterprise combinations and for interregional analyses.

In Iowa, resource information was developed for 27 farms representing the projected structure of Iowa farms in 1972. The linear programming model developed in this study will be used to estimate future supply response in feeder cattle production.

Trends and present status of all stages of beef production were described for Illinois. An analysis of farm records over 10 years revealed that changes in volume of cattle feeding bore little relation to the profitability of the enterprise. An aggregate resource linear programming model has been developed to evaluate the beef industry in the Corn Belt-Lake States. Work progresses on evaluating heat and chill stresses for cattle on feed and the heat increments included in different feeding rations.

In Nebraska, research was conducted to evaluate the price structure of the beef-pork sector of the U. S. economy. Transfer mechanisms between wholesale and retail market levels were found to be quite efficient, but the price structure between primary production and feedlot levels was weak and distorted. This suggests that improved supply-demand coordination at the production level could stabilize prices and increase efficiency.

In Oregon, a technique was developed for low cost estimating of cost of production using cross-sectional data obtained from field surveys. A spatial analysis of the feeder cattle, fed cattle, and carcass sectors of the U. S. beef industry nears completion.

Studies were completed on all aspects of custom cattle feeding in Colorado. Custom finishing for slaughter is most important, but custom backgrounding and wintering are increasing in importance.

B. Appraisal of Adjustments in Dairy Areas

In Connecticut, the multistage spatial and temporal allocation model for analysis of the Northeast dairy industry was completed. Initial applications of the model indicate that, in the period 1968-72, total milk production in the Northeast would decline 16 percent; consumption of fluid milk would decline 3 percent and consumption of manufacturing milk would decline 6 percent. Estimated demand and supply functions prepared for the model produced input data and useful trend information on per capita milk consumption and productivity changes in the Northeast.

Work in Delaware continued on the regional recursive model designed to determine and project the milk supply and economics of resource use in dairying. The model for the State of Connecticut was completed and a manuscript prepared. This manuscript does not include the predictive aspects of the study but only the analysis. Although cow numbers was the most important variable in estimating supply, expected milk prices were significant in several equations. Neither historical milk prices nor expected beef prices appeared to greatly affect producer's decisions in the use of dairy resources.

In Maine, a study was initiated to evaluate the impact of a sugarbeet production alternative on the organization of dairy farms. The analysis will consider recent and planned changes in dairy production practices and farm organization. A linear programming model was developed to reflect these and other changes in the dairy situation. Except for the sugarbeet enterprise, all input-output data and economic information for the model were assembled.

A cash flow analysis to determine the debt repayment ability of Maine dairy farms, was completed. This included development of a cash flow analysis form that can be used with farm records to evaluate loan applications. Equations using a few expense variables were developed to estimate total farm expenses when limited information is available from farm records. Coefficients for the estimating equations were obtained from farm record data using multiple linear regression techniques.

Work in New Hampshire continued on the regional simulation model for spatially dispersed economic systems. Two basic subroutines for the simulation model have been developed and tested. A linear programming transportation algorithm was adapted for the simulation model and a lockset routing model

was developed and tested. Contrary to published papers it was found that when carriers (e.g., milk trucks) have different capacities and there are several carriers, the lockset solution is not unique. Attempts to overcome this problem resulted in only limited success.

Some data on dairy service and product firms have been collected for the southeastern New Hampshire area. These will serve as input to the model once certain computational problems are overcome. Based on a survey conducted by the Cooperative Extension Service, a descriptive study of the New Hampshire Dairy Industry was undertaken. Preliminary results, based on multiple regression analysis, show a highly significant statistical relationship between cow numbers and age of operator, number of acres, number of corn acres, and amounts of family and hired labor.

Pennsylvania initiated a study of the optimum organization of large specialized dairy farms. Herd sizes of 100, 400, and 800 cows are being studied. Alternative physical plants have been designed and construction costs for some of the facilities have been estimated.

Work was also begun on the construction of a model for predicting milk production for each area in Pennsylvania. It will be designed to be integrated into a model of the assembly, processing, and distribution sectors of the dairy industry so that the effects of possible institutional changes on Pennsylvania dairy farmers may be evaluated.

Vermont expects to cooperate with New Hampshire in developing the regional spatial simulation model. To obtain the input data for this model, a mail survey of 500 randomly selected dairy farmers was made, with usable returns obtained from 237 farmers. Preliminary analysis of the data collected indicates that 100 percent of the commercial farmers had bulk tanks, 84 percent had every-other-day milk pickup, 78 percent used artificial insemination, and 19 percent of the barns were loose housing arrangements. Milk was conveyed to the bulk tank by pipeline on 47 percent of the farms. Corn silage was part of the winter roughage on 53 percent of the farms. In the summer roughage program, dairy farmers were becoming less dependent on pasture. High moisture corn was found on only 2 percent of the farms. These descriptive data will be used with other secondary data to develop the present and expected structure of the Vermont dairy industry. Service and supply firms are also being studied for inclusion in the spatial model.

C. Appraisal of Adjustments on Range Livestock Ranches

Following termination of Western Regional Project W-79, the Division's analysis of range beef cattle production has been redirected with a major objective of estimating supply response functions for feeder cattle. Knowledge of feeder cattle supplies will be used to appraise the future location of feeder cattle production and to examine the impact of various policy alternatives on feeder cattle supplies.

Data on land resources by use and capability have been assembled for the Western States by Division personnel in California, Colorado, Montana, Oregon and Texas. The inventory of land resources utilized data available through the Natural Resource Economics Division. Where NRED data are not available, the SCS Conservation Needs Inventory was used. Public grazing lands in the West and the animal unit months of grazing provided by public lands are included in the land inventory.

Along with the land inventory, data on livestock inventories in the Western States were assembled, giving as much attention as secondary data permit to numbers of animals by type and weight. This background information on land resources and livestock numbers will be used in conjunction with data from other areas to establish regional and national feeder cattle supply estimates.

In California a dynamic linear programming model of a cattle ranch was constructed. The model considers long-run growth alternatives under various physical and economic changes.

In Colorado the use of irrigated pastures in beef cattle production was analyzed. Preliminary results suggest that, compared to native pasture, production may be increased as much as 20 times through the establishment of improved irrigated pastures. The average cost per AUM of irrigated pasture in 1969 was found to be \$8.30. Another study in Colorado examined the potential for ranchers to retain ownership of calves and utilize custom feedlots for wintering and fattening them to slaughter weights. Investigations were also made in Colorado of the optimum enterprise combination and resource use on mountain cattle ranches. An experiment station bulletin reporting the results of this latter study is in process.

In Florida, costs of improved pasture programs were estimated for Central Florida beef cattle ranches. Establishment costs of pangola grass-clover pastures, including land clearing and preparation for seeding amounted to \$64.29 per acre. Annual maintenance costs were \$15.35 per acre. When seepage irrigation is used on pangola-clover pasture, costs of establishment increase to \$96.77 and annual maintenance costs to \$35.82 per acre. Increased costs with irrigation result from higher fertilization rate and costs of wells, ditches, and operation of irrigation equipment.

In Montana a dynamic linear programming model was used to study decision-making relative to range fertilization. Results of this research will be published.

In Oregon the fixed asset structure of the western range livestock sector was investigated. This analysis suggests that, because of the fixed asset structure, price responses are likely to be completely inelastic over a fairly wide range of livestock prices.

Research in Texas focused on returns to capital and management of 27

representative livestock ranches in the Edwards Plateau and the Central Basin land resource areas. Under the assumption of full ownership of ranch resources returns vary from -1.7 percent to 2.1 percent. However, by considering more characteristic proportions of land owned and leased, basing land values on an earlier land purchase date, and including land appreciation as potential income, returns increase to between 3.3 and 10.2 percent.

A cooperative project in New Mexico is directed toward revising the Division's costs and returns series on Southwestern Cattle Ranches to be more reflective of a viable ranching situation. The existing series depicts small, part-time ranching operations. The intent of the research effort is to revise the series to reflect investments, costs, and returns associated with full-time, commercial cattle ranches.

D. Appraisal of Adjustments in Rice Areas

In the Mississippi River Delta of Arkansas and Mississippi, an analysis of data from a survey of 140 rice farms is underway. Computer summaries of cropland use, regular and seasonal workers employed, and farm equipment inventories and operating costs were developed for medium and large rice farms. Interpretation and manuscript development is scheduled for early 1971.

In Louisiana the study of optimum enterprise mixes for the southwest rice area with special attention given to growing of feeder calves on selected winter forage is nearing completion. High rates of calving and abundant winter grazing crops appear to be key factors for optimizing returns from the conventional rice-rotation pasture programs. A study of farm machinery inventories on 118 rice farms was initiated and data on total costs as related to farm size (amount of annual use) are currently being analyzed.

In Texas a study of the practices used by farmers to obtain total financial resources required for a successful rice production operation was initiated. Schedules were taken for a sample of farms in two leading rice producing counties covering the operators equity in resources used, and the contributions which participating second parties (land or water lords, lending agencies, etc.) made toward the 1970 production operations. A wide variation in the equity position of rice farmers was revealed. Many specialty rice farmers are renters, only hold a nominal equity in their equipment, and contract for water and the seasonal capital required. Consequently their incomes are extremely sensitive to any price declines or other adversities.

In California a report of the extent of tenancy among rice farmers, and description of conventional rental agreements was developed. Additional analyses of management strategies that would optimize returns to renters versus owner operators are currently in progress. Division and university personnel (from several departments) are also participating in a team effort to identify critical areas in the total production process for rice on which

concentrated research is needed. The theoretical framework for this study, which will utilize the critical path model, has been developed. Also data for some 700 observations over a 4 year period on planting and harvesting dates, moisture levels at cutting, and yields by varieties have been compiled.

E. Appraisal of Adjustments in Wheat Areas

Analyses of regional adjustments in wheat areas of the Great Plains and Pacific Northwest were completed. The results of these wheat studies were published in two University of Nebraska Bulletins, Nos. 236 and 237. These regional projects are now terminated, but efforts have been made to initiate new regional studies of wheat in these areas.

In North Dakota, South Dakota, and Kansas work continued on preparation of publications of GP-5 results for areas in these States. Several manuscripts are in process and several were published in South Dakota. These reports will present optimal farm plans and wheat supply schedules for representative farms under a wide variety of product prices.

A cost-and-returns survey was taken on wheat farms in parts of eastern Montana and western North Dakota, in north central South Dakota, and in southern Nebraska and northern Kansas. The purpose of this work is to determine returns from wheat production in the three areas and to make comparisons of production practices. Results are being tabulated in all areas and have been prepared for publication for the Montana-North Dakota area.

Wheat production costs were determined in Nebraska, Idaho, and Washington. Manuscripts are in progress in all of these States. In Nebraska, costs were determined for three areas of the State. In Idaho, production costs and supply estimates were prepared for major wheat producing areas of the State. In Washington, results were published on costs of operating combines in eastern Washington for various levels of annual use and yield.

In Montana and Colorado, work proceeded on the economies of large-size wheat farms. Data are being collected on quantity discounts obtained on purchased inputs by operators of large farms. Budgets reflecting labor and machinery investments are being prepared for 3,000-, 6,000-, 9,000-, and 12,000-acre farms.

In Montana, long-term wheat yield data on State lease lands were analyzed to determine the variability of yields on individual tracts. A report based on this analysis is in process. These data are also being used in a dynamic programming model to study firm growth of cash grain farms in north central Montana.

In Kansas, work has proceeded on a methodological study of aggregate production response models. Models have been structured with varying amounts of individual farm detail specification and with different procedures to

estimate flexibility restraints. These models are being tested against historical occurrence of production.

New projects are being initiated in Nebraska and South Dakota which will emphasize analysis of farm policy. In Nebraska the impacts of alternative policies on wheat-beef production adjustments will be studied. Work in South Dakota will concentrate on the effects of policy alternatives on incomes of farm people.

F. Appraisal of Adjustments in Cotton, Tobacco, and Peanut Areas

In California, the regional effect of government payment limitations on cotton farms is being studied. Basic data were collected, including an inventory of land resources and crop patterns, in the San Joaquin Valley. Input-output budgets for cotton and competing crops were constructed and data on cotton allotment size distribution were obtained.

In the Mississippi Delta, work in cooperation with agronomists, entomologists and engineers continued on an analysis of selected cotton production systems. Practices such as stubble planting, narrow row spacing, and various insect and weed control measures were evaluated in field plots. Planting cotton on stubble beds proved encouraging. Yields equaled or exceeded conventional plantings and equipment and labor costs were \$5 to \$7 lower per acre. But part of this savings is offset by the cost of controlling winter vegetation. Some farmers in the area are also experimenting with stubble planting as a result of this research.

In Kentucky, a study was initiated to determine the impact of a decline in demand for tobacco on income distribution among tobacco growers and allotment owners. An enumerative survey was taken in a low income county and a relatively high income county to determine income, share arrangements, resources, etc. Analysis of data from the survey is underway.

A survey was made in the Virginia-North Carolina peanut producing area to identify operating characteristics of peanut farms, income, and other characteristics of growers and allotment owners. There were nearly twice as many land and allotment owners in the study area who did not operate a farm as there were farm operators. Of these "non-operator," about half were retired or disabled, 12 percent were businessmen, and 9 percent were salesmen. Of the farm operators, 16 percent were full owners, 48 percent were part owners, and 36 percent were cash or share renters. The average peanut allotment in the area is only 13 acres. But, the survey indicates that there are 46 acres per farm due to rental and leasing arrangements. An analysis of the impact of various program changes on the income of selected categories of people is underway.

SERVICE ACTIVITIES

Personnel engaged in adjustment studies are called on to service other programs in the Division. These include providing up-to-date enterprise budget

data for use in farm program appraisal or other policy analyses, providing current information on farm financial conditions used in preparing the Agricultural Finance Outlook, aiding in gathering and analyzing data for the various costs and returns series and in cotton cost analysis, and appraising estimates for various other productivity series prepared in the Division. Personnel also respond to requests for information at the State level, serve as Division representatives on various State and regional committees, and represent the Division and ERS in other activities relating to the Division's research program and mission.

FUTURE PLANS

Future analyses in the feed-livestock area will focus on an evaluation of regional production potentials for cattle feeding to meet projected beef needs. In the dairy areas, attention will be directed toward projecting rates of change in numbers and sizes of farms over the long run, and in determining the effects on input suppliers and local economies in areas of decline.

In the range-livestock and other major beef cattle producing areas, attention will be focused on determining the long-run potential for expanded production of feeder cattle by regions. In rice, cotton, and peanut areas, more attention will be given to Government programs and export policies and their effects on prices and production. In tobacco and wheat areas work will be directed toward determining impacts on production and farm income of limitations on program payments and toward the changing structure of the farming sector.

PUBLICATIONS -- USDA AND COOPERATIVE PROGRAM

A. Appraisal of Adjustments in Feed-Livestock Areas

Gee, C. Kerry. 1970. Custom cattle fattening in Colorado. Colo. State Univ. Expt. Sta. Bull. No. GS-899. 14 pp.

Gee, C. Kerry. 1969. Seasonal cattle feedlots in Colorado. Colo. State Univ. Expt. Sta. Bull. No. 540-S. 34 pp.

Gilliam, Henry C., Jr. 1970. Production of beef cattle in the south-east: selected characteristics and trends. Econ. Info. Rpt. No. 16. 50 pp.

Johnson, J. B., Vaile, R. E., and Youde, J. G. 1970. Characteristics of the Pacific Northwest beef feedlots. Oreg. Agr. Expt. Sta. Spec. Rpt. No. 285. 41 pp.

Martin, Neil R., Jr., Petritz, David C., and Van Arsdall, Roy N. 1969. The Illinois beef industry -- characteristics, trends, and inventories. Ill. Agr. Expt. Sta. AERR-101. 39 pp.

B. Appraisal of Adjustments in Dairy Areas

Kottke, Marvin. 1970. Spatial, temporal, and product-use allocation of milk in an imperfectly competitive dairy industry. Am. Jour. Agr. Econ., Vol. 52, pp. 33-40.

Zepp, Glenn A. and McAlexander, R. H. 1969. Predicting aggregate milk production: an empirical study. Am. Jour. Agr. Econ. Vol. 51, No. 3, pp. 642-649.

Zepp, Glenn A. and McAlexander, R. H. 1969. An evaluation of aggregate milk output models. Penn. Agr. Econ. and Rur. Soc. No. 85, 26 pp.

C. Appraisal of Adjustments on Range Livestock Ranches

None.

D. Appraisal of Adjustments in Rice Areas

Grant, Warren R. and Moore, D. S. 1969. Application of an economic model for evaluating government program costs for rice. Tex. Agr. Expt. Sta. Dept. Tech. Rpt. No. 69-1. 18 pp.

Grant, Warren R. and Moore, D. S. 1969. Alternative government rice programs -- an economic evaluation. Agr. Econ. Rpt. No. 187. 55 pp.

Grant, Warren R. 1970. Application of an economic model for evaluating government program costs for rice. Amer. Jour. Agr. Econ. 52(2), pp. 209-215.

Hottel, J. B., Grant, W. R., and Mullins, Troy. 1969. Equipment technology and weather on rice farms in the Grand Prairie, Arkansas, Part II, economies of size for specified tractor and labor combinations. Ark. Agr. Expt. Sta. Bull. 748. 27 pp.

Godwin, Marshall R. and Jones, Lonnie L. 1970. The southern rice industry. Tex. A&M Univ. Press. 222 pp.

E. Appraisal of Adjustments in Wheat Areas

Heid, Walter G., Jr., and Larson, Donald K. 1969. Fertilizer use in Montana, 1954-1967, with comparisons. Mont. Agr. Expt. Sta. Bull. No. 628. 55 pp.

Heid, Walter G., Jr. 1969. Montana farm adjustments and their economic effects on farm income, 1954-1967. Mont. Agr. Expt. Sta. Bull. No. 629. 23 pp.

Helmers, Glenn A. and Lagrone, W. F. 1970. Wheat and feed grains in the Great Plains and Northwest: supply response and resource use. Great Plains Agr. Council No. 37 and Nebr. Agr. Expt. Sta. Res. Bull. No. 236. 85 pp.

Lagrone, W. F., Hatch, Roy E., and Helmers, Glenn A. 1970. Wheat and feed grains in the Great Plains and Northwest: study area descriptions and state statistical summaries. Great Plains Agr. Council No. 38 and Nebr. Agr. Expt. Sta. Res. Bull. No. 237. 96 pp.

Ullrich, Erwin O., Jr., and Sanderson, John T. 1969. Effect of alternative wheat and feed grain prices on optimum farm plans and income in north central South Dakota, Campbell, Edmunds, McPherson, and Walworth counties. S. Dak. Agr. Expt. Sta. Bull. No. 561. 20 pp.

Ullrich, Erwin O., Jr., and Sanderson, John T. 1969. Effect of alternative wheat and feed grain prices on optimum farm plans and income in north central South Dakota, Faulk and Potter counties. S. Dak. Agr. Expt. Sta. Bull. No. 562. 16 pp.

Ullrich, Erwin O., Jr., and Sanderson, John T. 1970. Effect of alternative wheat and feed grain prices on optimum farm plans and income in central South Dakota, Hughes and Sully counties. S. Dak. Agr. Expt. Sta. Bull. No. 570. 24 pp.

Ullrich, Erwin O., Jr., and Sanderson, John T. 1970. Effect of alternative wheat and feed grain prices on optimum farm plans and income in

central South Dakota, Aurora, Brule, Charles Mix, Gregory, and Jerauld counties. S. Dak. Agr. Expt. Sta. Bull. No. 574. 24 pp.

F. Appraisal of Adjustments in Cotton, Tobacco, and Peanut Areas

Barnhill, Harold E. 1969. Minimum land requirements for \$5,000 operator earnings in the hill area of west Tennessee. Tenn. Agr. Expt. Sta. Bull. 460. 43 pp.

Davis, Bob and Chappell, J. S. 1969. Alternative tobacco harvesting and curing systems for the North Carolina Coastal Plains. N. C. State Univ. Dept. of Econ. EIR-12. 69 pp.

Glover, Glenn H. 1969. Costs of farm machinery used for cotton production in Tennessee. Tenn. Agr. Expt. Sta. Bull. 458. 67 pp.

Grise, Verner N. and Thompson, James F. 1970. Effects of burley tobacco prices and allotment levels on profitable farm adjustments in four areas of Kentucky. Ky. Agr. Expt. Sta. and Dept. of Agr. Econ. Res. Rpt. 3. 51 pp.

Hughes, William F. and Harman, Wyatte L. 1969. Projected economic life of water resources, Subdivision Number 1 High Plains Underground Water Reservoir. Tex. Agr. Expt. Sta. Tech. Mono. 6. 82 pp.

AREA NO. 2. PRODUCTION RESPONSE AND
FARM PROGRAM APPRAISAL

Problem. Adjustment opportunities cannot be considered solely from the viewpoint of the individual farmer. Studies of adjustments by commodities and areas provide background data necessary for more aggregative studies. These additional studies are needed to develop and analyze the consequences of alternative Federal farm programs which will: (a) Create a healthy economic environment for U. S. commercial agriculture, (b) bring about needed lasting adjustments in resources, (c) bring production in line with market demands, and (d) satisfy other income goals for U. S. agriculture. Continuing analyses of trends in farm output and resource productivity also are needed to measure changes in the farm situation.

OBJECTIVES -- USDA AND COOPERATIVE PROGRAM

The program encompasses three major types of work. Studies of national and regional productivity conducted in Washington, D. C. analyze the factors responsible for changes in total output and resource productivity for the Nation and for 10 broad farm production regions. These studies become the basis for long-term projections of prospective trends in farm output and productivity, in numbers of farms, and in other major characteristics of the Nation's agriculture. Studies of production response and needs for adjustment are conducted in Washington, D. C. and at several Field locations. Using about 100 somewhat homogenous production regions and size of farm strata, and appropriate enterprise alternatives and flexibility constraints on production changes in each region or size stratum, these studies emphasize the production response farmers are likely to make in the aggregate to changes in product prices, Government programs, technology, costs and other factors. Studies of agricultural policies and program appraisals are oriented toward an understanding of the impacts and means of improving programs and policies at the national level, including analyses of the acreage allotment and marketing quota programs, wheat programs, current feed grain programs, long-term land retirement programs, and studies of alternatives to present programs.

A cooperative study with the Oklahoma Experiment Station designed to test farmers' reactions to current and alternative programs was completed in FY 1970. Cooperation is maintained with the experiment stations in Arizona, Colorado, Georgia, Iowa, Oklahoma, and Washington where work is underway on estimating the aggregate response to alternative programs and program provisions. Also, cooperative research is carried out with the Oregon station.

PROGRESS -- USDA AND COOPERATIVE PROGRAMS

A. National and Regional Productivity in Agriculture

U. S. farm output reached a new high in 1969, 1 percent greater than in 1968. Total production of livestock and their products was 1 percent above the previous high and 18 percent above the 1957-59 average. Meat animal output equaled the 1968 record. A slight reduction in hog, sheep, and lamb production was offset by an increase in cattle and calf production. Combined poultry and egg production increased nearly 3 percent. Broilers continued the upward trend of recent decades, but egg outturn dropped slightly. Dairy products remained at the 1968 level.

Crop production in 1969 set a new high for the third consecutive year. Feed grain output increased 4 percent over the 1968 level despite 2 percent fewer harvested acres. Food grain production declined 8 percent, but the harvested acreage was down 13 percent. Oil crop production advanced for the fifth consecutive year because of a record production of soybeans and peanuts. The only other crop groups to reach new highs were hay and forage, fruits and nuts, and sugar.

Total volume of farm inputs in 1969 increased 1 percent. The composition of inputs, however, continued to change as farmers substituted more productive inputs for less productive ones. Inputs of farm labor continued to decline, whereas those of farm real estate remained at about the same level for the last 5 years. All other inputs groups, chiefly purchased inputs, continued their recent uptrend. Purchased inputs in 1969 accounted for three-fourths of all inputs used in farming. Farm output per input unit was 8 percent greater than in 1957-59.

Reappraisals of prospective crop yields indicated some adjustments were necessary for a few crops, particularly for cotton. The adjustments in projected yields were based on data such as trends in fertilizer used per acre, acres irrigated, and recent yield levels. Cotton yields in 1980 are projected to be 560 pounds compared to 680 pounds projected earlier. Estimates of total farm output, livestock production and crop production were made for 1980.

A pilot study analyzing the effects of weather and technology on crop yields, being conducted jointly with the Oregon Experiment Station, was continued. This research program is limited to wheat in the Northwest. A methodological approach to the problem of predicting wheat yields on the basis of meteorological data was adopted. The Palmer hydrologic accounting system was altered to obtain more meaningful hydrologic variables for use as independent weather variables in a production function for wheat. Previous results suggested that monthly periods, on which the hydrologic accounting procedure was based, were too long to be of practical use. Furthermore, the standard accounting system makes no provision for fallow moisture build-up. With these limitations in mind, the Palmer hydrologic accounting system was

modified to allow for fallow moisture and the accounting period was changed from one month to eight days.

On the basis of the redesigned accounting system an aggregate production function was developed for the Columbia Basin of Oregon and on the county level for the most prominent wheat-producing counties in Oregon using various weather variables. The individual results were not encouraging, but best results from each model have been incorporated into a synthesized model for the entire Columbia Basin of Oregon.

B. Appraisal of Production Response and Needs for Adjustment

Production response estimates for major crops for the 1970 crop year for selected payment, diversion, and price support rates under the Agricultural Act of 1965 were prepared for administrative use. Publication of enterprise budgets used in the analysis is in process for the North Central, Northwest, Southeast, South Central, and Great Plains regions. Reports on production response of cotton, feed grain, soybeans, and wheat producers to farm program provisions are in draft.

Analyses of alternative general land retirement schemes were completed, comparing the probable outcome of a general cropland retirement program retiring land with the lowest net return per acre to the probable outcome of a program retiring land having the highest per unit production costs. Estimates were made of (1) location of the retired cropland, (2) cost to the Government, and (3) impact on production potential after retiring different amounts of cropland nationally with the two programs. Highlights of this study include these conclusions: (1) Under the acreage criterion, land retirement is concentrated in the wheat producing regions of the Great Plains and in the cotton producing areas of the Southeast and Southern Plains; (2) with the production criterion, land retirement shifts to the feed grain producing areas of the Great Plains, the Lake States, the Corn Belt, and the Southeast; (3) acreage criterion programs retire more wheat production than do production criterion programs; (4) production criterion programs result in greater cuts in soybean, corn, and cotton production while wheat is less affected; (5) general cropland retirement programs based on production criterion may reduce the adjustment impact on some communities; and (6) compared with acreage criterion, the production criterion tends to shift land retirement from the Great Plains to the Corn Belt and Lake States where there are more opportunities for farmers to shift to off-farm employment.

Analyses of farm program proposals affected but did not determine the Administration's farm program proposal to Congress. Analysis of the Administration's Set-Aside proposal indicated a potential production of 209 million tons of feed grains and 1,450 thousand bushels of wheat. These findings contributed to the inclusion of a direct acreage control option for feed grains and wheat in the Administration's proposal.

The effects of limiting farm program payments on payment distribution, production, and Treasury costs were studied and reported administratively. These studies indicated that the greatest potential effect of payment limitations would be on cotton producers. There would be less effect on wheat producers, and the smallest effect would be on feed grain producers. Other highlights of the payment limit analysis are: (1) A \$55 thousand payment limit would affect approximately 1,100 cotton producers, 100 wheat producers and 100 feed grain producers; (2) the potential reduction in Treasury cost is about \$60 million with \$59 million of that amount being cotton payments; (3) a \$20 thousand payment limit would affect approximately 6,000 cotton producers, 2,000 feed grain producers and 1,500 wheat producers; and (4) a payment limit applied to the total payments to allotments or bases owned by any one person may be a more effective way of limiting the benefits received by a given person.

C. Appraisal of Agricultural Policies and Programs

A study of the tenure status of participants in the 1968 cotton, feed grain, and wheat programs indicates that nearly 80 percent of the producers had an interest in only one farm. Of producers receiving \$10,000 or more, however, 66 percent had an interest in two or more farms. This percentage was about the same for producers receiving \$20,000 or more. When compared by programs, 67 percent of the cotton producers receiving \$10,000 or more had an interest in more than one farm. For feed grain and wheat producers, these percentages were 59 and 60, respectively. For producers receiving \$20,000 or more, the percentage having an interest in two or more farms were 62, 61, and 64 for cotton, feed grain, and wheat producers, respectively.

About 21 percent of total cotton allotments was on farms of producers who received \$20,000 or more in cotton program payments and had an interest in two or more farms. Less than 1 percent of the feed grain bases and about 2 percent of the wheat allotments were on farms controlled at least in part by similar producers in each of these two programs.

A study has been initiated to develop a benchmark supply function for potential cropland from reclamation of undeveloped land and restoration of idle or abandoned land that could be used for crops, for the major cropland areas of the United States. The model has been specified, the data collected, and results are being tabulated. No findings are available at this time.

Work was begun on analysis of the kind of farms and producers that participated in the 1969 cotton, feed grain, and wheat programs. The sample of producers in the study included 1 percent of those receiving less than \$3,000 of government payments in 1969, 5 percent of those receiving between \$3,000 and \$10,000, and all producers receiving \$10,000 or more. The data will be summarized in tables useful for projecting producers' response to alternative program proposals, payment rates and payment limitations.

A study of 193 farms in 4 counties in Oklahoma showed that the ranking of farm programs according to their theoretical efficiency is not confirmed by an analysis of farmers' responses. The farmer response analysis indicated four programs which would retire at least nine percent of the available cropland and remove over \$2.00 of crop output per dollar of program cost. In decreasing order of efficiency these four programs were: Ten-year retirement of wheat allotments with an equivalent acreage of cropland, one-year retirement of wheat allotments with an equivalent acreage of cropland, ten-year retirement of the farm's entire cropland base, and cropping easements on the farm's entire cropland base. Part-farm retirement programs which offset only a small portion of each farm's cropland base were generally ineffective and inefficient. There were no large differences in efficiency between one-year programs and longer term retirement. Use of standardized retirement payments by the Government tend to overpay some farms in relation to the amount of production removed, thereby reducing program efficiency from what might be obtained by means of a competitive bidding system.

SERVICE ACTIVITIES

Major service work consisted of supplying data and analyses for the Office of the Secretary. Analyses were made of alternative proposals for programs to replace those authorized by the Agricultural Act of 1965 when it expires at the end of 1970. Materials supplied were used by the Office of the Secretary, members and committees of Congress, and the Administrator of the Agricultural Stabilization and Conservation Service.

FUTURE PLANS

Future work includes completion of the study of the tenure of farm program participants and the probable effect of tenure on payment limitations, further analysis of the Oklahoma survey data to estimate the effects that grazing diverted acres would have on the efficiency of farm programs, completion of the study on a supply function for land, and continued analysis of the probable response to the farm programs proposed in the Agricultural Act of 1970.

PUBLICATIONS -- USDA AND COOPERATIVE PROGRAM

A. National and Regional Productivity in Agriculture

Farm Production Economics Division. 1969. Changes in farm production and efficiency. Stat. Bull. 233 (revised). 17 pp.

Farm Production Economics Division. 1969. Changes in farm production and efficiency. Index numbers of farm production, by groups of live-stock and crops, for each farm production region, 1939-68. Stat. Bull. 233 (revised). Supp. 1. 12 pp.

B. Appraisal of Production Response and Needs for Adjustment

Slaughter, Rudie W., Jr. 1969. Payment limitations: Effect on supply adjustment and income distribution. Jour. Agr. Econ. 51(5), pp. 1233-1236.

Sundquist, W. B. and Zepp, Glenn A. 1970. Impacts of a general cropland retirement program on the Great Plains. Presented, Proceedings of Great Plains Agricultural Council, July 30 - August 1, Oklahoma City, Okla.

Zepp, Glenn A. and McAlexander, Robert H. 1969. Predicting aggregate milk production: An empirical study. Am. Jour. Agr. Econ. 51(3), pp. 642-649.

Zepp, Glenn A. and McAlexander, Robert H. 1969. An evaluation of aggregate milk output response models. Penn. Agr. and Rur. Soc. (in coop. with Econ. Res. Serv.) Dept. Agr. Econ. and Rur. Soc. Bull. No. 85. 26 pp.

C. Appraisal of Agricultural Policies and Programs

Carr, A. Barry. 1969. Long-term versus short-term land retirement. Jour. Agr. Econ. 51(5), pp. 1524-1527.

AREA NO. 3. STRUCTURE OF AGRICULTURE
AND ECONOMICS OF FARM SIZE

Problem. Widespread public concern has developed in recent years about the organization and structure of the food and fiber industry. At the farm production level, questions arise concerning the impact of new technology on the number and size of farms. Changes are occurring in the marketing and distribution of both farm inputs and farm outputs. These are believed to be accelerating the technological changes taking place on farms. Contractual arrangements and other forms of vertical coordination are being applied to an increasing number of farm products. Questions are being raised about the implication of such changes for our traditional farming systems. The continuing decline in farm numbers and the emergence of large-scale factory-type operations, often as a part of a larger agribusiness complex, raise questions concerning their impact on rural communities and the viability of traditional marketing systems. What steps, if any, should be taken to soften the impact, or to check a possible trend toward an industrialized agriculture?

OBJECTIVES -- USDA AND COOPERATIVE PROGRAM

Changes in the number, size and legal form of organization of farm businesses are periodically analyzed and evaluated with respect to possible future trends. Special attention is given to the relative position of family-size and larger-than-family size farms in terms of numbers, total farm marketings, capital and land resources, hired labor, and the age and tenure of farm operators.

Basic to the analysis of probable future trends is an understanding of the economic incentives for the expansion in the size of farm businesses. Past studies have examined internal technical efficiencies of size, but have been less thorough with respect to possible cost savings in the purchase of farm inputs, access to credit and the marketing of output. Income tax considerations and rate of return on investment have become more relevant criteria for appraising the potentials for larger size farms than the conventional measures of lowest cost of production and labor earnings. Forms of business organization other than the sole proprietorship, such as partnerships, joint ventures, and corporations may offer better opportunities for gaining the use of land and capital resources, more favorable tax treatment and more profitable market outlets.

PROGRESS -- USDA AND COOPERATIVE PROGRAM

A. Vertical Coordination and Changing Structure

A final report on corporations with agricultural operations is in the review stage. It will show that in 1968, about 13,300 corporations in the 50

States accounted for one percent of all commercial farms and 7 percent of the land in farms. California and Florida together accounted for about one-third of the total number. Nearly two-thirds of all farming corporations were family owned and controlled. About 100 corporations having farming operations had their stock listed and traded on organized exchanges. Gross sales of farm products by all corporations were estimated at \$3.3 billion or 8 percent of total sales of all farms in 1967.

A system has been developed to monitor new farm ventures, mergers and acquisitions and new public offerings of stock or limited partnership interests by agribusiness firms. Widely selected publications are being constantly reviewed to identify the firms involved and the actions being taken to achieve vertical coordination by contractual arrangements and mergers or by direct ownership of production facilities. Two separate reports of such developments have been prepared for limited distribution. A total of 54 acquisitions and mergers were identified in 1969, of which 30 were classified as vertical extension or horizontal extension into new products. Many of these were centered in the cattlefeeding and slaughter area and in poultry, chiefly broilers and eggs. Such activities slowed somewhat in the first half of 1970, but there was evidence of substantial interest in both large-scale hog production and in contractual arrangements by both the feed industry and processors. New public offerings of equity interests in agribusiness firms were at a slower rate in 1970 than in 1969 because of adverse market conditions. However, an increase was noted in offerings in cattlefeeding and cattle breeding ventures, despite the less favorable tax treatment given to these activities by the 1969 tax reform bill.

An analysis of financial, income and expense data for corporations classified as farms by the Internal Revenue Service is nearing completion. Data summarized from tax returns have been analyzed by size of firms, as measured by gross business receipts and total assets, and for firms with, and without net profits. A separate analysis is being made for the 5,400 small business (subchapter S) returns and for the 13,500 general corporation returns reported for 1966. Similar data for 1967 will be incorporated in the final report.

Progress was made in developing a model of a business arrangement to facilitate consolidation of existing farm ownership units into a closely held corporation. The main objective is to devise an alternative to the sole proprietorship which would provide tax advantages and facilitate inter-generation transfer of farm property. A means for acquiring equity capital from investors for the purchase of farm machinery to operate such a consolidated unit was also considered. Additional work is required to more fully develop the steps needed to achieve these goals and the tax implications.

Initial steps were taken to identify those aspects of hog production to be included in the regional project on the hog-pork subsector. Such questions

as the size and geographic distribution of hog production units, the production systems employed, and shifts in geographic distribution of production were not included in the original project outline. The feed industry may be a major force in developing contractual arrangements with producers and warrants further analysis. A project proposal has been developed which would examine the steps taken or contemplated by firms at various levels in the hog-pork system to achieve better coordination of production with processors' and consumers' requirements.

A comparative analysis of family-size and larger-than-family size farms is in review draft stage. Based on special tabulations from the 1959 and 1964 censuses the study concludes that the relative importance of each group of farms has not changed significantly. Family farms have become larger through increased productivity of operator and family labor as a result of new technology. However, the importance of family-size farms varies substantially among regions and by type of farm. The greatest contrast was found between Iowa and California. In Iowa, 91 percent of all sales of farm products came from family farms, but in California the proportion was only 21 percent. Similarly, family farms accounted for only 15 and 29 percent of the gross sales on vegetable and fruit and nut farms, respectively, as compared to 85 and 82 percent of the sales from cash grain and tobacco farms. Nationally, it is estimated that 95 percent of all farms and 62 percent of the sales of all farm products were associated with family farms in 1969.

B. Economics of Farm Size and Number of Farms

Results of a special analysis of the 31,000 farms having sales of \$100,000 or more in 1964 were reported last year. The publication is now available. No significant additional work has been done in this area, pending the availability of new data from the 1969 Census of Agriculture.

Field studies were completed for 48 farms in the Midwest producing 1,000 acres or more of corn. Results indicated that a 5,000-acre corn farm is able to obtain savings of \$10 an acre or more in the purchase of supplies and in marketing compared with a 500-acre farm. Internal production efficiency was judged to be about the same. Higher labor and management costs were more than offset by the use of larger and more efficient machines. Rates of return on investment after income taxes are equal to, or greater than, returns from smaller family-size units. Results of the study were presented at the annual meeting of the American Agricultural Economics Association and will be published in the proceedings.

FUTURE PLANS

Additional work remains to be done on the analysis of income tax data for corporate farms. Also, it is anticipated that considerable new data pertaining to incorporated farm businesses will become available from the 1969 Census of Agriculture. These data should provide a basis for updating and expanding the descriptive analysis of such farms.

It is planned to continue the monitoring of new developments pertaining to mergers, acquisitions and new farming ventures. Summaries will be prepared at approximately 6-month intervals for limited distribution. A separate analysis may be made of approximately 50 new offerings of equity securities covering such items as amount of capital obtained, the costs of raising such capital, and the type of securities offered. The financial progress of new firms will also be followed.

The major allocation of manpower will be in the hog-pork subsector project. An exploratory survey is planned of a small number of the larger and more innovative firms in the feed manufacturing, hog production, hog slaughtering and pork retailing industries. Partially-structured interviews will be conducted with key personnel in such firms to obtain insights regarding the incentives and problems their firms have encountered in seeking to achieve better alternatives to the existing marketing system. The interviews will focus on the vertical linkages between major inputs, production, processing, and marketing. The results should contribute to the proposed symposium on vertical coordination in the hog-pork subsector planned for the spring of 1971, and also identify areas that warrant more intensive study.

One part of the above general area will seek to document the role of the feed industry in livestock production, with special reference to hogs. A recent nationwide survey of feed mills provides the sampling framework to direct a special mail questionnaire to those firms that are involved in livestock production either through direct ownership of production facilities, or by means of contractual arrangements.

PUBLICATIONS -- USDA AND COOPERATIVE PROGRAM

A. Vertical Coordination and Changing Structure

Bursch, William G. 1969. Pricing structure and service costs in the retail feed market in Illinois. Univ. of Ill., AERR-100. 13 pp.

Moore, C. V. and Snyder, J. H. 1970. Corporate farming in California, California Agriculture, Vol. 24, No. 3. pp. 6-8.

Scofield, William H. 1969. Corporate farm ownership and operation. In, Economics of Conglomerate Growth, Oreg. State Univ. pp. 106-110.

Scofield, William H. 1970. Conglomerates in agriculture. Proceedings, 14th National Conference of Bargaining Cooperatives. pp. 69-75.

Scofield, William H. 1970. The agribusiness complex. Jour. American Society of Farm Managers and Rural Appraisers, Vol. 34, No. 1. pp. 21-24.

B. Economics of Farm Size and Number of Farms

Heid, Walter G., Jr. 1969. Pecuniary economies and internal diseconomies of large size dryland wheat farms. Proceedings, Western Agr. Econ. Assoc. pp. 27-30.

Nikolitch, Radoje. 1970. Our 31,000 largest farms. Agr. Econ. Rpt. No. 175. 64 pp.

Sitler, Harry, and Krause, K. R. 1969. Research on large size farms. Proceedings, Western Agr. Econ. Assoc. pp. 24-27.

AREA NO. 4. FINANCING THE FARM SECTOR

Problem. Farming has become increasingly capital intensive, a development that has not only affected the financial structure of the farm sector but has also made it more dependent upon, and interrelated with, the financial markets. Sources and availability of credit and financing have been shifting and important adjustments have been occurring in costs of capital and in loan repayment terms. Changes in financing and other economic forces have made a great impact on the level of assets and debts and on asset-debt relationships in the farm sector. The financial situation of farmers and their capacity to carry their debts may change from year to year in different areas. The level of income received by farm people, and the distribution of income among different classes of farmers, are areas where more study is needed to adequately appraise the financial wellbeing of the sector. With increased capital values have come greater risks of loss and a need for improved insurance and other means of financial protection. Measurement of financial change and analysis of structural developments in the farm sector are needed for the guidance of farmers and lenders, and to aid policymakers and program administrators in improving farm programs.

OBJECTIVES -- USDA AND COOPERATIVE PROGRAM

The work in this area comprises a continuing program of statistical and economic research involving: The balance sheet of the farming sector and financial outlook; analysis of farm financial markets; agricultural insurance; and sources and distribution of farmers' incomes.

The objectives in preparing the balance sheet of the farming sector are to measure and explain changes in the asset-debt situation of farmers and other owners of farm businesses. This work is conducted in Washington, D. C. and involves the assembly and analyses of data obtained from Division sources, other USDA agencies, other Federal agencies and financial institutions. The financial outlook report appraises the current and prospective financial situation of farm people for the annual USDA Outlook Conference. It is prepared in Washington but is based on surveys of farmers, farm lenders and other knowledgeable persons in various sections of the country.

Analyses of farm financial markets are based in Washington, D. C. and involve studying sources of credit and other financing for different segments of the farm sector. Included are the changing characteristics of the financial markets, economic environment in which they operate, and their capacity to provide financing in adequate amounts and terms at reasonable cost. Data are obtained from lenders and from sample surveys. The Census sample surveys of agriculture provide periodic information such as the distribution of mortgage debt among various types, sizes, and economic classes of farms.

The objectives of the work in agricultural insurance are to determine and measure various physical risks faced by farmers and the cost of dealing with them. Analysis is also made of the characteristics and effectiveness of different types of insurance and insurance institutions. Work is done in Washington, D. C. on the basis of data obtained from other Federal agencies, insurance companies and their statistical associations, and State insurance commissioners.

The analysis of the income situation of individuals in the farm sector is done in Washington, D. C. and is based on secondary data including Federal income tax returns of farmers. Objectives include estimation of the distribution of farm and nonfarm income among farmers, comparative returns to resources used in farming, and effects of existing and alternative policies, programs, and institutions on income distribution and the wellbeing of individuals participating in the production process.

PROGRESS -- USDA AND COOPERATIVE PROGRAM

A. The Balance Sheet of the Farming Sector and Financial Outlook

The equity of proprietors in farm assets rose to \$253.4 billion on January 1, 1970. The increase of \$8.8 billion in 1969 was 3.6 percent compared with a 4.7 percent growth in 1968. The slower gain resulted mainly from a smaller than usual advance in value of real estate and continued expansion of debt. Farm assets totaled \$311.4 billion at the beginning of 1970, up \$12.3 billion or 4.1 percent from a year earlier. Farm debt (including CCC loans) on January 1, 1970, was \$58.1 billion -- up \$3.5 billion or a 6.4 percent increase.

The value of farm real estate increased \$6.3 billion in 1969 for a 3.1 percent rise. On the other hand, the value of livestock and poultry in farms increased \$3.3 billion or 16.3 percent. During the 1960's, farm real estate value averaged a 6 percent increase annually; livestock and poultry averaged about 5 percent annually.

Farm debt grew at an annual rate of 13 percent during the 1960 decade. Real estate debt and non-real estate debt increased at equal rates. The ratio of total debt to total assets on January 1, 1970 was 19 percent having climbed steadily from a ratio of 12 percent ten years earlier.

Balance sheets of the farming sector as of January 1, 1970 were developed for each of the 10 farm production regions and for each of 6 economic classes. Balance sheets for the U. S. showing major assets on a cost basis and on a constant 1947-49 price basis were continued.

Study of the financial structure of 2,100 commercial Corn Belt farms showed apparent positive relationships between size of operation and amount of debt, investments per acre, and product sales per acre. The relationship between size of farm operation and age of operator appeared to be inverse indicating

that farm size expansion has come mainly from younger operators that depend rather heavily on credit to help them acquire larger, better equipped, and more productive operations.

A survey of the financial outlook in early 1970 indicated that farmers would further expand their use of credit. Interest rates which were near record highs were expected to ease somewhat in the second half of 1970. Funds for short and intermediate-term loans were expected to be more adequate than funds for long-term loans. The outlook for obtaining financing was best for those with good managerial ability and high production.

B. Analysis of Farm Financial Markets

On January 1, 1969, the Federal land banks replaced life insurance companies as institutions holding the largest volume of farm-mortgage loans. The volume of loans held by life insurance companies was \$5.4 billion on June 30, 1970 -- nearly 2 percent below a year earlier. The volume held by Federal land banks, \$7.0 billion, was nearly 7 percent higher. The decrease for the life insurance companies was due to restrictions placed on lending by State usury laws, resistance to the high interest rates, and alternative investment opportunities.

Insured loans held by the Farmers Home Administration totaled \$3.9 billion on March 31, 1970 -- an increase of 26 percent over a year earlier. The major increase was in insured rural-housing loans which totaled \$1.8 billion compared with \$1.3 billion a year earlier.

Interest rates for long-term farm mortgage loans and shorter-term farm operating loans were at near record levels during the first half of 1970. Mortgage rates were mostly in the 9.0 - 9.5 percent range, while operating and cattle purchase loans ranged mostly from 8.0 to 9.5 percent. This was a reversal of the usual situation of shorter-term loans having the higher rates.

The average interest rate on life insurance company farm-mortgage loans rose from 7.9 percent to 9.3 percent between the first half of 1969 and the first half of 1970. Rates charged by Federal land banks on June 30, 1970, ranged from 8.0 - 9.0 percent, compared to 7.0 - 8.0 percent a year earlier.

An analysis of the characteristics of farm-mortgages recorded during the first half of 1969 shows a spread of as much as 1 percentage point in interest rates between type of farming areas within a State. Mortgage rates on new loans in the California specialty farming area averaged 7.5 percent compared with 6.5 percent in the Northwest Dairy area. The range in the term of loan by type of farming was also significant. Loans recorded in the Northeast farming area averaged 25 years compared with only 12 years in the Central Cotton area.

C. Agricultural Insurance

Crop-hail insurance and all-risk crop insurance were shown in an economic analysis to be basically different, with all-risk insurance presenting special problems in setting premium rates, establishing reserves, and avoiding adverse risks. Variability of indemnities as a percent of premiums was twice as large for all-risk as for crop-hail insurance in 1948-67. The study outlined a method of predicting all-risk crop insurance indemnities by normal distribution theory along with "areas under the normal curve" as related to crop yields.

Crop-hail insurance and Federal crop insurance in combination protected growers against a potential crop loss of \$4.5 billion in 1969. Farmers paid premiums of \$176 million and received indemnities of \$136 million. Largest premium expenditures of \$49 million were in the Corn Belt followed by \$42 million in the Northern Plains.

D. Sources and Distribution of Farmer's Incomes

Analysis of Federal income tax returns showed combined farm and off-farm income of individuals with farm earnings averaged \$6,880 in 1966 -- up from \$4,650 in 1963. Off-farm wage and salary earnings increased from \$4,280 to \$5,410.

A study of Federal income tax returns reveals that the amount of farm program payments is less concentrated among individuals than is their income from all sources. This preliminary finding suggests that farm payments have a leveling effect on the distribution of income among recipients.

SERVICE ACTIVITIES

Because of the Division's responsibility for assembling statistics on farm debt and credit, financial assets, and lending institutions, many special requests are received each year for farm financial data and analyses of such data. Requests come from administrators and researchers in universities, Government and industry, Congressmen and Senators, foreign embassies, national farm magazines and news services, farm lenders, and persons within USDA and other governmental agencies.

Considerable service work also is done in responding to inquiries from the Secretary's Office, Congress, and farm groups concerning the financial and credit situation of farmers in various geographic areas. The group has representation on the National Agricultural Credit Committee, an organization consisting of major farm lenders who meet several times a year to keep abreast of changes in land values, credit markets, and credit status of farmers. One member of the Agricultural Finance staff acts as secretary to the Committee.

One staff member participated in a committee which reviewed the functions and activities of the Farm Credit Administration and made recommendations for changes to the Farm Credit Board. Several staff members responded to requests of the Assistant Secretary of Agriculture for data and analyses of the adequacy of credit in rural areas and for an appraisal relative to the need for a rural development bank. One member reported to the Alabama Bankers Association on the future credit requirements for agriculture.

In addition to answering inquiries and supplying data on farm losses and insurance to insurance companies, Department officials, farmers, and the general public, considerable time was spent studying the special problems of all-risk crop insurance. This was part of research initiated earlier of an evaluation of the Federal Crop Insurance Corporation.

FUTURE PLANS

Work will continue on improving the quality of data relating to the balance sheet items. Research is underway using data from the 1966 Pesticide survey to construct balance sheets of the farming sector by type and size of farm. Data from the special farm finance census survey in 1971 will be analyzed and are expected to provide more basis for State estimates. In cooperation with life insurance companies and the Farm Credit System, additional data on the characteristics of individual real estate loans will be secured.

Research will continue on the quality of farm loans and the adequacy of lending institutions. An analysis of investment portfolios of the major life insurance companies is planned. Study will be made of needed changes in the financial structure of lending institutions if they are to provide adequate credit to agriculture in the future.

Work in agricultural insurance will continue to keep abreast of developments with respect to determining and measuring farm risks. Series on crop insurance losses will be maintained and investigation will be made of insurance company statistical associations as possible sources of information on fire, wind and other losses to farm property.

Study will continue on the sources, level, and distribution of individual incomes of farmers. Increased attention will be given to comparison of returns to resources used in farming with earnings of similar resources elsewhere in the economy. More emphasis will be given to net worth, as income alone often fails to measure financial wellbeing.

PUBLICATIONS -- USDA AND COOPERATIVE PROGRAM

A. The Balance Sheet of the Farm Sector and Financial Outlook

Farm Production Economics Division. 1970. The balance sheet of Agriculture 1969. Agr. Inf. Bul. No. 340. 35 pp.

Farm Production Economics Division. 1970. 1970 agricultural finance outlook. AFO-9. 35 pp.

B. Analysis of Farm Financial Markets

Farm Production Economics Division. 1969. Farm mortgage debt. FMD-8. 8 pp.

Farm Production Economics Division. 1969. Farm mortgage lending. FML-23. 15 pp.

Farm Production Economics Division. 1970. Farm mortgage lending. FML-24. 26 pp.

Farm Production Economics Division. 1970. Agr. Fin. Rev. Vol. 30 Supplement. 81 pp.

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Herr, William McD. 1970. Characteristics of new borrowers obtaining farm ownership loans from the Farmers Home Administration -- Fiscal 1966. Agr. Econ. Rpt. 184. 18 pp.

Irwin, George D., Lins, David A., and Penson, John B., Jr. 1970. Flow-of-funds: an adjunct to income and balance sheet accounts in understanding the financial structure of the farming sector. Agr. Fin. Rev. Vol. 31, p. 11-26.

Penson, John B., Jr., and Warren, Forest G. 1970. Life insurance company farm-mortgage loans -- a statistical study of loans outstanding, September 30, 1966. ERS-439. 50 pp.

C. Agricultural Insurance

Jones, Lawrence A. 1969. Crop-hail insurance 1967-68, volume, cost, indemnities. ERS-424. 13 pp.

Jones, Lawrence A. 1970. Crop-hail insurance 1969, volume, cost, indemnities. ERS-424. 11 pp.

D. Source and Distribution of Farmers' Incomes

Reinsel, Edward and Browning, Thomas. 1970. Federal income tax payments from the farm sector. Agr. Fin. Rev. Vol. 31. pp. 35-48.

AREA NO. 5. FARM FINANCIAL MANAGEMENT

Problem. Financial decisions are becoming more crucial to the survival and growth of farm firms. Problems of financial management become increasingly important as farmers behave more like managers of nonfarm businesses. With the increasing use of capital in agriculture, the farmer has more alternative sources from which to choose his inputs and resources. As an entrepreneur he is concerned with developing financial objectives for his farm business and in making the best use of his own resources and those of others to achieve his objectives. Strategies for acquiring machinery services, plans for growth of the firm, and managing nonfarm investments may be involved. Not only must the farm entrepreneur consider the potential net returns, but the financial risks must also be appraised. One facet of the economic environment that is more and more influencing farm business profits and decisions is tax policy, especially that related to Federal income taxes.

OBJECTIVES -- USDA AND COOPERATIVE PROGRAM

Research on farm financial management is done in Washington and cooperatively at several State experiment stations. This area of research is relatively new. One objective has been to develop concepts, definitions, and research methodology. Other objectives are analysis of the various financial goals of farmers and determination of attitudes toward achieving these goals.

Research objectives concerning farmer practices include: Studying financial strategies associated with depreciation and replacement of machinery and livestock; appraising the comparative advantages of credit and equity and renting versus ownership; and the analysis of insurance and reserves. The objectives of research on current and proposed Federal tax policy are to explain and measure the impacts on amount and type of investment in farming and to determine the appropriate strategies for tax management. Research on financial management is being conducted cooperatively with State experiment stations in Florida, Texas, Oklahoma, and Washington. At Oregon State University work on noneconomic factors that affect the financial management decisions of range livestock producers is being conducted under a research contract.

PROGRESS -- USDA AND COOPERATIVE PROGRAM

A. Economics of Financial Management

In Washington, D. C. work has begun on an annotated bibliography of research in farm financial management. Input-output data by type of farming also are being assembled from State universities and USDA sources to provide technical coefficients for future studies.

In Oregon, survey schedules have been developed, tested, and some interviews completed regarding the goals and goal achievements of cattle and crop farmers. Initial results indicate that in addition to the profit motive, such things as ethnic background, age, family composition, and location affect the decision structure of farmers.

In Michigan nine farm operations in the eastern Corn Belt were synthetically constructed to represent target combinations of resources for 1980. These include 80, 200, and 1,000 cow dairy herds; 640, 1,680, 4,160 acre cash grain farms; and 375, 900, and 6,000 head beef feeding operations. Detailed 1980 budgets including investments, income, and expense statements were constructed for each unit. The coefficients estimated in this study provide realistic reference units that can be used to analyze various aspects of financing specialized types of farm firms in 1980. Financing needs to adjust from present farm operations to the reference units were determined and the implications for lending institutions and adequacy of current credit arrangements evaluated.

B. Acquisition of Farm Production Services and Resources

In Indiana an analytic procedure for studying effects of financing alternative for the acquisition of machine services was converted to a Fortran computer program. Test runs have been made using several tax situations, and a users description of the program developed. Experimental design procedures are being used to set up a number of simulation runs to examine the general properties of the model. Census data on leasing, custom hire, and purchase of machines were examined, and a number of company financed conditional sale and lease contracts were assembled.

Columbia Basin and wheat-pea farmers gave varied reasons for their decisions to replace an older machine with a newer one, purchasing an additional machine, and substituting leasing or custom hire for machine ownership. The reasons include cost saving, budget constraints, increase in farm size, tax benefits, risk aversion, and values. A combination of land ownership and leasing appeared to play a major role in the growth in farm size. Over a twelve year period farmers who made substantial use of leased land in addition to land ownership generally increased farm size at a faster rate than those who did not lease land.

Work in Texas was begun to identify and analyze the financial aspects of acquiring, maintaining, and utilizing resources associated with the rice producing industry. Interrelationships between resource owners and users are being explored.

C. Management for Growth of Farm Firms

In Washington, D. C., analyses using a farm firm growth and decision simulator indicated that Corn Belt grain farmers with average managerial ability could not endure interest rates higher than 12 percent while farmers with

high managerial ability could increase their net worth even with interest rates of 18 percent. Livestock as an investment alternative made growth of the firm possible in some cases with interest rate levels at 21 percent.

At Purdue University, a simulation model was used to test the effect and interactions of several strategies on the growth of a hypothetical Corn Belt farm. A Ph. D. thesis was written and other articles incorporating the results are underway. Findings indicate that livestock as well as leasing of farmland can greatly influence the growth of the firm. A method of choosing among alternatives was devised for farmers interested in rapid growth. A means of projecting prices and yields into the future, so that crop and livestock enterprises retain their historical relationships was developed. Lastly, a formula was devised for determining "predicted" values which deviate with any desired distance and probability from known "actual" values.

Michigan research on financial alternatives for expansion of dairy farms found the amount of beginning equity held by the operator and the down payment requirements of loans to have the greatest impact on his potential rate of growth in terms of increasing net worth and income for family living. Varying lengths of repayment plans had little effect on either net worth or consumption. Lower down payment requirements can substitute for additional equity in terms of increasing net worth and gaining control of assets. However, this is accompanied by a much larger outstanding debt and a higher debt-asset ratio over time, indicating a greater degree of risk. Longer repayment terms are useful in terms of flexibility for the operator. They allow repayments to more closely approximate repayment capacity, and can aid in keeping an appropriate ratio of short to long-term debt.

In Kansas a study is being made of the Association between farm characteristics and growth rate. Results indicate the group of farms with the fastest growth rate had large increases in land farmed, relative increases in livestock investments and increased use of labor. Farmers in the group were younger. They operated the smallest farms in 1950, but the largest in 1964.

D. Tax Management for Farm Firms

An in-house seminar on farm corporations and their income tax treatment was conducted in Washington, D. C. to help appraise research problems and needs. Proceedings of the seminar have been distributed to assist other researchers and teaching and extension personnel in developing insights into Federal income taxation and its impact on the farm sector.

A Washington based analysis of the Tax Reform Act of 1969 showed it to represent a complex and sweeping revision of the Internal Revenue Code.

A report that was prepared and widely distributed among farmers and extension workers reviewed tax changes of most significance to farmers and provided background information relative to the issues associated with these changes.

SERVICE ACTIVITIES

As researchers have developed concepts and methodology in financial management research they have been frequently consulted by those in the State experiment stations and elsewhere who are developing studies in this new field. A staff member is technical advisor on a cooperative financial study in Oklahoma and has been consulted by ERS fieldmen in Montana, Tennessee, Washington, New York, and Texas.

A tape of a firm growth and decision simulator was prepared and sent to economists at the University of Edinburg, Scotland who have adopted it for their use.

A staff member, under auspices of AID, assisted the National Land Reform Institute in Columbia, South America in developing an accounting system for its supervised credit program.

As research in the Federal tax area progresses, researchers are increasingly consulted relative to the impact of Federal tax provisions, actual and proposed, and on the farm sector. By request of the office of the Secretary, staff members have appraised the impact on the farm sector of proposed tax legislation. In addition, staff members have answered requests from other USDA agencies, Federal agencies outside USDA, State universities, and private organizations.

A staff member served with the Extension Service committee responsible for advising with IRS on the preparation of the 1971 Farmers Tax Guide. This staff member also served as consultant to a State extension representative charged with revising a farm tax management guide widely used in extension educational programs.

FUTURE PLANS

Financial management concepts and research methodology developed earlier will be extended and tested in a broadened number of States. Emphasis in new projects will be on unexplored areas as will be revealed by current work on a bibliography of research in financial management. Work will continue on an accounting and analytical system for financial management and on an inventory of input-output data needed for research.

A study currently underway seeks to identify the impact of proposed changes in the Federal estate tax on farm estates. The findings of this study are intended to provide information on estate sizes, liquidity problems, and capital appreciation in farm estates. Legislative hearings on proposals which would substantially revamp the Federal estate and gifts tax structure are expected in the next Congressional session.

Effects of changes in farm tax rules included in the Tax Reform Act of 1969 will continue to be analyzed. There is considerable interest in farm tax

provisions that appear to offer special tax advantages to investors with large nonfarm incomes. The impact of the "citrus provision" of the Tax Reform Act on citrus grove ownership and new citrus plantings will be studied in light of its implications to these types of investors and to the citrus industry.

PUBLICATIONS -- USDA AND COOPERATIVE PROGRAM

A. Economics of Financial Management

Bostwick, Don. 1970. Definitions of some terms used in financial management. Agr. Fin. Rev. Vol. 31. pp. 49-52.

Bostwick, Don. 1969. Effects of machinery control strategies on income. Agr. Fin. Rev. Vol. 30. pp. 34-43.

Bostwick, Don. 1969. Financial returns in agriculture. Jour. Agr. Econ. 51(3) pp. 662-665.

Bostwick, Don. 1970. Financial returns in agriculture: reply. Jour. Agr. Econ. 52(1). p. 153.

Bostwick, Don. 1969. Returns to farm resources. Jour. Agr. Econ. 51(5) pp. 1527-1535.

B. Acquisition of Farm Production Services and Resources

None.

C. Management for Growth of Farm Firms

Harrison, Virden L., Langbehn, Cay, and Eisgruber, Ludwig M. 1969. Capital accumulation and resource adjustments on Indiana farms 1945-65. Economic and Marketing Information for Indiana Farmers. Purdue Agr. Ext. Ser. pp. 1-3.

Whittlesey, Norman K., and Umberger, Dwaine E. 1970. Financial structure of large farms in the Columbia Basin Project. Wash. Agr. Sta. Bul. 719. 16 pp.

D. Tax Management for Farm Firms

Rodewald, Gordon E., Jr. 1969. A method for analyzing the effect of taxes and financing on investment decisions. Jour. Agr. Econ. 51(5). pp. 1178-1181.

Woods, W. Fred, and Krause, K. R. 1970. Farm corporations and their income tax treatment. Proceedings of a 2-day seminar on interpreting income tax regulations for research on farm corporations. Unnumbered document. 276 pp.

Woods, W. Fred. 1970. The Tax Reform Act of 1969, provisions of significance to farmers. ERS-441. 17 pp.

Woods, W. Fred. 1970. The Tax Reform Act and farmers. Agr. Fin. Rev. Vol. 31. pp. 1-10.

AREA NO. 6. FARMLAND VALUES AND VALUATION

Problem. Farm real estate amounts to about 80 percent of all farm production assets. Shifts in its value, in methods of acquiring control, and in methods of disposing of it have major economic significance. Farm operators' responses to price signals in the commodity markets and to various income and welfare programs are strongly influenced by their position in the real estate purchase and rental markets. Federal and State agencies need to be aware of the impact of Government programs on real estate values since real estate represents such a large percentage of the wealth of the farm production sector. Credit agencies and commercial lenders need current information to use in appraising the effects of their credit policies on their own positions, and the ability of asset holders or prospective asset holders to acquire credit.

Since 1950, major changes have occurred in the tenure structure of the farm production sector. The numbers of full tenants and full owner operators have declined along with the acres of land controlled by each. During the same period, the number of part-owner farmers has also declined but their control of farm real estate has increased in both absolute and relative terms. Thus, traditional data on tenure relating to full owners and full tenants now has less relevance to the analysis of farm earnings and the distribution of income between farm owner operators, tenants, and landlords.

As land values increase and as farmers attempt to expand the size of their operations, the traditional tenure ladder from tenant to full owner appears to be breaking down. The goal of resource control seems to be replacing the goal of full ownership. Thus, benefits and costs of various farm programs have a different impact today than when the programs were established. The magnitude and distribution of these costs and benefits is of major importance to policymakers concerned with the farm production sector.

OBJECTIVES -- USDA AND COOPERATIVE PROGRAM

The program of continuing research is designed to obtain current information on farm real estate sales and rental markets at both the State and national levels. Changes in market prices of farm real estate, rental rates, volume and methods of transfer, sources and amounts of credit, and types of buyers and sellers are measured on a periodic basis. Semiannual surveys of real estate brokers and other informed people are used to provide basic data on current conditions in the farm real estate sales market. These data, along with estimates of market value, rates of transfer, and rents paid -- obtained from USDA crop reporters -- are summarized in semiannual reports which frequently include special articles related to specific problems.

Recently, more detailed information has been collected on the rural nonfarm sector of the land market, including sales of rural land for nonfarm uses.

Supplementing the above analyses are special studies on such topics as farm building valuation, determination of a cost basis for farmland, and alternative measures of land earnings. Liaison is maintained with Federal and private credit agencies and with private farm real estate sales and management organizations.

The research program in Washington is supplemented by cooperative studies with State experiment stations where specific segments of the farm real estate and farm rental markets are studied in greater depth than is possible at the national level. A study currently in progress in Oregon will attempt to measure the effects of urban and recreation development on farmland values.

PROGRESS -- USDA AND COOPERATIVE PROGRAM

A. Current Developments in the Farm Real Estate Market

Nationally, farmland values rose 4 percent during the year ended March 1, 1970 -- the smallest increase in 7 years. Real estate reporters indicated that tight credit markets and uncertainty over future farm programs contributed to the slowdown. Market values declined in Indiana, Illinois, Kansas, and North Carolina but increased sharply in Pennsylvania, New Jersey, New Hampshire, Maryland, and Florida. Compared with previous years more reporters in March 1970 believed that prices would either remain stable or decline over the next year.

The average value of an acre of farm real estate increased during the year, reaching \$193 on March 1, 1970. Per acre values ranged widely by States from \$36 in Wyoming to \$1,028 in New Jersey. In the Corn Belt values averaged \$380 per acre. Fewer buyers were actively looking for farmland in early 1970. Slack demand appeared to be widespread in the cotton and wheat areas but some downward shift occurred in all areas except the Northeast. Although the number of farms and parcels offered for sale remained stable, the rate of voluntary transfers declined 9 percent from March 1969 to 1970.

Farm real estate sellers provided financing for 53 percent of all credit purchases in the year ending March 1, 1970 -- up from 43 percent a year earlier. Insurance company financing dropped from 10 percent to 5 percent. Financing by Federal land banks and commercial banks remained generally unchanged.

B. Analysis of Factors Affecting Land Values and Transfers

Estimates of return to farmland by economic class show that returns increase with farm size. Rates of return on Class I farms (\$40,000 or more sales) were about double those of Class III farms. In contrast, farms in the smaller economic classes received negative returns to real estate. The negative return on smaller farms implies a payment for the use of the dwelling as a rural residence.

Preliminary estimates of real wealth changes show that landowners were in about the same real wealth position in 1969 as in 1960. The real wealth position of landowners increased from 1960 through 1966 and decreased from 1967 through 1969. Projecting through 1970, landowners who purchased land in 1960 and held it through 1970 will have suffered a loss in the purchasing power of their real estate.

In Oregon a study of the farmland market in three areas confirms the hypothesis that single equation regression models should be developed separately for rural, urban, and recreational areas. Use of dummy variables to account for regional difference in land values is not justified. Farm income was found to be significant in the rural areas with an implied capitalization rate of about 5 percent.

An analysis of the valuation of agricultural land in cotton producing areas of the South Carolina Coastal Plains shows that each additional pound of historical tobacco production per acre in a tract was associated with an increase of about \$1.80 in the price of land. Conversely, prices paid by add-on buyers were estimated to decrease by about \$6.60 per acre with each additional mile of separation between the purchased tract and land already owned.

C. Agricultural Rents

Fifty-five percent of all farmland rented in 1964 was rented for cash. Between 1961 and 1968, gross cash rents per acre increased at a slower rate than land values; landlords expenditures per acre also increased. Thus, net rents moved upward even more slowly. Cash renting is increasing in the United States, in part because of increased renting by part-owners who tend to use cash leases more frequently than full tenants. Farm operators tend to operate all the land they own and not to rent to other farmers. Thus the percentage of land rented from nonoperator landlords has increased.

A project was developed on the farmland rental market in the Lake States and Corn Belt Regions. The primary emphasis of the study will be on the analysis of the effectiveness of local rental markets and a description of the characteristics of the market participants.

SERVICE ACTIVITIES

The Farm Real Estate Group publishes estimates of grazing fees per head per month on privately owned land. The estimates are used by the Forest Service and the Bureau of Land Management to develop an index for updating grazing fees on Government land. Special articles are prepared for the Balance Sheet of Agriculture and the **Agricultural Finance Outlook**. Monthly columns written by members of the staff appear under the heading "Tales from the Computer" in The Farm and Land Realtor published by the National Association of Real Estate Boards. Land value indexes are produced for Federal Reserve and Farm Credit Administration districts on a semiannual basis.

FUTURE PLANS

Work in the area of farmland values will undergo a shift in emphasis from the real estate sales market to work related to farm tenure and land rental. Collection of basic sales data will continue, but will become a somewhat smaller part of the overall research program. The reason for the shift is the pronounced change occurring in the tenure structure of commercial agriculture, and the need to develop in greater detail the relationship between the farmland purchase, farmland rental, and farm credit markets.

Work in the rental area is seriously hampered by a lack of primary data on leasing practices on part-owner farms, and the division of rents between farm and nonfarm landlords.

Efforts will be made to develop a specific farm rental and farmland ownership survey to provide more recent benchmarks and a current description of the tenure structure.

PUBLICATIONS -- USDA AND COOPERATIVE PROGRAM

A. Current Developments in the Farm Real Estate Market

Economic Research Service. 1969. Farm real estate market developments. CD-73. 36 pp.

Economic Research Service. 1970. Farm real estate market developments. CD-74. 17 pp.

B. Analysis of Factors Affecting Land Values and Transfers

Johnson, Bruce. 1970. Returns to farm real estate. Agr. Fin. Rev. Vol. 31, pp. 27-34.

C. Agricultural Rents

None.

AREA NO. 7. ECONOMICS OF FARM PRACTICES AND TECHNOLOGY

Problem. Changing conditions of farm production brought about by new kinds of machines and equipment, improved methods of crop and livestock production, and an increasing concern about the effects of fertilizers, pesticides, and animal wastes on the environment result in the need for continuing economic studies. Such studies evaluate the impact of restricting or banning the use of pesticides, keep abreast of major changes in farming technology, and appraise the implications of these changes on farm production. They include analyses to provide information needed by farmers as they adjust to trends in technology, prices, and costs. They also include analyses aimed at guiding policymakers and program administrators as well as at helping industry meet the needs of farmers.

OBJECTIVES -- USDA AND COOPERATIVE PROGRAM

This research consists of two major parts: A continuing program of collection and analysis of data bearing on questions of national importance such as pesticides use and disposal of animal wastes, and studies of important innovations in farm practices and technology. The program includes the development of aggregate measures of the effects of technological changes on farm output, costs, and income.

More specifically, the work involves the collection of pertinent data and the economic analysis of developments in farm mechanization, structures, fertilizer, pesticides, related crop practices, and in livestock and livestock feed. These activities center in Washington, D. C., and consist mainly of broad national studies dealing with both the supply and demand aspects of these production elements. Studies usually involve at least the informal cooperation of other USDA agencies, particularly the Statistical Reporting Service and the natural science and engineering groups in the Agricultural Research Service who deal with mechanization, crop practices, and livestock feeding.

Research results are usually presented in aggregate terms for areas, States, or regions, along with supporting data such as input-output ratios. Intensive studies of narrower scope are made occasionally in selected areas to obtain information to supplement national and regional data from other sources. Such studies are usually in cooperation with State experiment stations, currently in California, Illinois, Iowa, Michigan, Missouri, Minnesota, and Nebraska.

PROGRESS -- USDA AND COOPERATIVE PROGRAM

A. Economics of Pesticide Use in Agriculture

Continuing research on the economics of pesticide use deals with costs of

pesticide practices and changes over time. Expenditure data from nationwide enumerative surveys show total pesticide expenditures by farmers increasing from \$489 million in 1964 to \$561 million in 1966, or 15 percent. Most pesticides are used in treating crops -- \$506 million of the \$561 million in 1966. The highest expenditures for pesticide materials for individual crops were for corn, \$135 million, and cotton, \$94 million. Pesticide expenditures for these two crops accounted for 45 percent of all pesticide expenditures used in crop production.

Herbicide costs for farmers were \$243 million, or 48 percent of total pesticide expenditures for crops. Insecticide costs were \$195 million, or more than 38 percent of the total for crops; and fungicide costs were \$33 million, or close to 7 percent of the total. Weed control for corn, cotton, and soybeans accounted for almost 70 percent of the expenditures for herbicides. Insecticide costs for corn and cotton together were 50 percent of insect control expenses. Disease control in producing apples and all other fruit, including citrus, accounted for 65 percent of total fungicide expenditures.

Study of the economic consequences of restricting the use of organochlorine insecticides showed that more than three-fourths of the 72 million pounds of organochlorines used by farmers on four crops in 1966 could have been replaced by other insecticides. However, costs for insect control on these crops would have increased \$2.23 an acre treated, for a total of nearly \$27 million. This is about 0.3 percent of their 1966 farm value.

Forty-two million pounds of organophosphorus and carbamate insecticides would have been required to replace approximately 55 million pounds of organochlorines, mainly toxaphene, DDT, and aldrin, used on the four crops in 1966. The principal chemicals that would have been substituted were methyl parathion, diazinon, and carbaryl. For effective insect control on cotton and corn, 17 million pounds of organochlorines would still have been needed. On cotton, some of the substitute chemicals would have required supplementation, while on corn the organochlorines were the only effective insecticides for certain insects.

A special study of the effects of prohibiting the use of phenoxy herbicides (44 million pounds yearly) showed that in 1969 farmers direct production costs would have increased about \$290 million if farm output were maintained. The increase in costs represents about 1 percent of the farm value of all crops or 5 percent of the value of crops from the treated acres. The amount is nearly 3 times that spent for weed control by the use of phenoxy herbicides, and constitutes an increase in costs of \$4.64 per treated acre. The total additional costs would have been distributed among crops as follows: Corn, 37 percent; wheat, 17 percent; other small grains, 10 percent; sorghum, 4 percent; rice, 3 percent; other crops, 6 percent; pasture, 11 percent; and rangeland, 12 percent. In addition to these increased costs, farm operators and their families would have needed to provide nearly 20 million hours of additional labor to maintain current production and marketings.

Continuing research on the economic evaluation of pesticide use in Nebraska and other North Central States showed that banning the use of phenoxy herbicides on representative commercial wheat farms in the Northern Plains would reduce farm income from \$1,800 to \$4,000 annually. Incomes on 1,400 acre Nebraska farms would be reduced about \$1,800 annually over time. Lower yields would be partially offset by savings in herbicide costs and no harvesting costs on some abandoned acres. Incomes on 1,000 acre South Dakota farms would be down \$4,000 annually largely due to lower yields and abandoned acreages. The lower costs from not using herbicides would be offset by costs of additional tillage operations. About 120 hours of additional labor would be required in both areas for additional tillage on summer fallow and abandoned acreages.

In a symposium on economic research on pesticides for policy decisionmaking, 20 speakers, representing both the biological and social sciences, reported on approaches to pest control that focus on significant policy questions. The purpose of the symposium was to review the present status of economic research on pesticides and to identify new areas to meet future needs for policy decisions. The most promising types of research on the basis of topics developed at the workshop and on past experience include (1) continuing the assessment of costs of restricting certain pesticides, (2) minimizing pollution hazards by using pesticides only when needed, (3) exploring the opportunities for substituting other inputs, particularly land, for pesticides, and (4) considering costs and benefits accruing to several groups of people -- one of which would be society as a whole.

A study on the extent of pesticides used on selected vegetables, fruits, and nuts showed that, in general more acres were treated for insects and soil organisms than for weeds or disease control. For crops on which both weeds and diseases were treated, more acres were treated for diseases than for weeds. However, for certain crops (e.g. cherries and grapes) a high percentage of the acres was treated for diseases, and for certain other crops (e.g. sweet corn) a high percentage was treated for weeds. There were large differences in pesticide practices among regions. For example, herbicides were not much used on farms in the Southeast but were used on some of the acreages of each crop in the Northeast, in the Lake States, and on most crops in the Pacific Region. These findings supplied information useful in measuring the extent of pesticides use by crops and in estimating possible environmental effects.

In a special study concerned with disposal of pesticide residues, it was estimated that 91 million pesticide containers were used by farmers in the United States in 1966. These containers were used to package about 750 million pounds of formulated pesticides or an average of 8 pounds per package. About two-thirds of the materials were formulated as dry materials (wetttable powders, granules, and dusts) and one-third as liquid formulations or emulsifiable concentrates. These findings were reported in the proceedings of the National Working Conference on Pesticide Disposal, Beltsville, Md., June 30 - July 1, under the title "Farmers' Use of Pesticides and Pesticide Containers."

The conference dealt with the problem of safe disposal of pesticides residues.

B. Economics of Feed Use and Feed-Livestock Relationships

Continuing research at the national level aims to measure effects of existing and new technology on feeding efficiency in livestock and poultry production and associated supply industries. Annual data on current feeding rates for all principal kinds of livestock and poultry are developed. Significant trends in the livestock-feed industry are identified. Animal unit and feed unit series are related to total production of feeds and livestock.

Annual revisions of State and national data on livestock numbers and feed consumption were processed and the several indexes based on them were revised. The contribution of pasture and grazing (in terms of feed units) was recalculated incorporating new data on body weights of cattle. Factors for determining pasture consumption were revised. State data for livestock-production units were computed.

In cooperation with ASCS, a survey of all feed mills in the 48 States was undertaken. The mailing list included all feed mills registered with the Food and Drug Administration as well as major livestock and poultry producers who manufacture their own feed in their own mills. Many of these represent integrated operations. About 15,000 forms were mailed. Return of the forms was mandatory since most of the data are essential for civil defense purposes. About two-thirds of the survey forms had been returned by June 30, 1970.

The economic role of beef cattle futures in spreading risk and influencing size of cattlefeeding operations is being studied in Minnesota. A beef futures data file of prices and other information generated by the market during 1969-70 was updated. Further work was undertaken on the effectiveness of beef futures for performing the functions of risk-shifting and pricing. Results of work and talks with local Minneapolis-St. Paul bankers indicate that in certain instances beef futures are effective instruments for shifting risks and forward pricing of cattle but that hedging has had little effect in financing.

During the year, several hedging decision models were developed for cattle-feeders under different structural and behavioral assumptions. These models are designed to indicate optimal production-marketing and hedging strategies for alternative production-marketing conditions.

C. Inventory and Analysis of Production Practices

A report on machine size and type by economic class, type of farm, and farm production region, based on data from the 1964 National Pesticide Survey, was cleared for publication. The data show that much of the machinery in use was relatively small and possibilities of labor savings are still quite extensive.

A manuscript "Hay Harvesting Practices and Labor Used, 48 States, 1967" was prepared. Results were summarized in last year's progress report.

A manuscript entitled "Hay Harvesting in the Northeast, Labor Efficiency and Custom Use of Alternative Systems, 1967" is being edited for publication by the University of Maryland. The data show that in 1967, the cutter-bar mower, present on 80 percent of the farms surveyed, was used to cut 59 percent of the Northeast hay acreage. Windrower or swather-conditioners, which require fewer man-hours per acre than cutter-bar mowers and side delivery rakes, have received only token acceptance as weather in most areas of the Northeast does not allow hay to cure properly in the windrow.

In 1967, 95 percent of the bales were twine-tied. The regional average labor input for the baling operation was 0.7 man-hours per acre, and 1.7 man-hours were used in loading and storing hay.

Data on the age, size and use of tractors and combines, from the 1966 Pesticide and General Farm Survey, are being processed in cooperation with the Iowa Experiment Station. Programming difficulties have restricted progress in summarizing these data.

A 48 State survey on small grain and corn harvesting and labor use in 1969 was taken in April 1970. Additional coding by county on the questionnaires from crop reporters will provide data for analysis at less than the State level. Data are on tape and have been machine edited.

Continuing research on principal machines on farms shows that with a high level of gross farm income, farmers continue to improve their inventory of machines. Gross capital expenditures for machines and motor vehicles (including tractors) in 1969 were 77 percent above expenditures in 1960. Between these dates, cost rates of commodities and services used in farm production were up 27 percent; gross farm income, 43 percent; farm wage rates, 60 percent; and wholesale prices of machinery 27 percent.

Despite recent declines in shipments and sales of farm machinery, future demand at a relatively high level seems assured. Replacement will be less important than in the past. Substitution of larger equipment for small equipment will continue and this will make possible more output with less labor input.

Change in input capability may be illustrated by change in tractor size. In 1960, on-farm tractors averaged about 33 maximum belt horsepower -- in 1970, over 45, and will exceed 50 in 1975. With a continuing decline in the number of farmworkers, available horsepower from tractors alone will be near 60 per worker in 1975 compared with 45 in 1970.

Large size machines increase the degree of mechanization. Relating man-hours of labor input for all farmwork to inventory value of machinery shows an investment of only \$1.95 per man-hour in 1960. In 1969, this rate was \$4.03.

D. Economics of Fertilizer Use and Crop Technology

Preliminary work was developed toward preparation of an annual "Fertilizer Situation Report." Series of data on production, consumption and prices of fertilizer were developed. The report analyzes the impact of fertilizer use on farmer costs and returns, evaluates factors affecting fertilizer demand and makes projections of fertilizer use in the 70's. Some of the sections included in the report are: Outlook for 1971 for fertilizer supply, use and prices; yields and fertilizer use by crops; outlook for 1980 for fertilizer use and acres for crop production; and seasonality of fertilizer use. The target date for publication is December 1, 1970.

An analysis of the current and changing structure of the nitrogen fertilizer industry and the effect on farm firms is being made. The changing structure of the nitrogen fertilizer industry was examined through an analysis of relevant structure variables. Economies of scale curves for the manufacturing segment show that a significant reduction in costs has taken place in the industry. The evidence from this cost-feasibility segment indicates that technology has been an important factor and has led to the entry of large efficient ammonia plants, resulting in an oversupply of nitrogen and in declining and unstable prices. These changes have also brought about a transformation in the structure of the retail industry. Needing a market for the increased supply of nitrogen, the manufacturers have tried to obtain control over the retailing sector through vertical integration, by mergers, and by building their own facilities.

An economic analysis and projection of fertilizer demand relationships was made. An Illinois plant nutrient use situation report was prepared. It was estimated that 87 percent of the total quantity of N, P, and K applied in Illinois is now applied to corn, about 5 percent is applied to wheat, and less than 3 percent is applied to soybeans. The plant nutrients used on corn approximately doubled during the 6-year period, 1964-69. However, application rates per acre appear to be increasing at a lower rate.

Preliminary statistical analysis of regional supply-demand relationships has been made. Factors such as prices of crops, prices of other inputs, weather, farm income, ratios of corn acreage to legume acreages, and others are being examined to measure their impact on fertilizer use on corn.

SERVICE ACTIVITIES

These activities consist mainly of providing information, upon telephone or written request, concerning the subject matter of the research area. Such requests, for example, may involve current and future use of pesticides, fertilizer, or machinery, or the economic feasibility of establishing a livestock feeding facility in a certain location. Requests come from within the Department, other Government agencies, individuals, industry, and Members of the Congress. A number of requests for information have come from writers preparing feature articles for trade journals. Many requests come from

citizens of foreign countries. Service activities also include regular contributions of data and analysis to USDA publications, such as Outlook and Situation Reports and the Yearbook of Agriculture, committee assignments, and other joint efforts within the Department.

FUTURE PLANS

A. Economics of Pesticide Use in Agriculture

Another nationwide enumerative survey is planned to get up-to-date information to show changes and indicate trends in quantities and costs of pesticides used. Additional information related to pesticide buying practices will be obtained.

The current effort to identify and measure the importance of factors associated with pesticide use will be continued. Plans include initiation of an economic study involving controlled experiments on specific pesticides. This would be interdisciplinary work located at a Federal or State experiment station. Several proposals have been discussed with ARS researchers. The evaluation of survey data as a means of describing the relation between production and pesticide use will continue.

Future work will also include continuing assessment of costs of restricting certain pesticides. Some work is currently being initiated that considers costs and benefits of pesticides accruing to users and to society as a whole. Future studies will deal with minimizing pollution hazards by using pesticides only when needed, and with exploring opportunities for substituting other inputs, particularly land, for pesticides.

B. Economics of Feed Use and Feed-Livestock Relationships

Work will continue on the Feed Mill Survey. Programming for an extensive machine edit is underway. Tabulation of data will be computerized. Work is underway on specifications for such tabulations. Considerable effort (mostly by ASCS) will be required to secure data from nonrespondents (estimated at about 3,400). A preliminary report to release data in a timely manner is planned. More detailed analysis will follow as time and personnel permit.

Research in this area will continue to evaluate the economic effects of innovations on various parts of the industry. If possible, innovations need to be anticipated and effects projected. Size and structure of the formula feed industry will be ascertained, and pricing practices and economies of size more fully delineated and evaluated.

Basic feed-livestock data will continue to be gathered and computed in order that reliable, uniform data will be available. Such data are needed to project prospective developments, both shortrun and longrun, in the feeding industry at the regional and national levels.

C. Inventory and Analysis of Production Practices

A nationwide study on production of animal waste and the methods, labor and equipment involved in waste disposal is planned for 1971-72. This survey will give insights into the magnitude of the waste disposal problem and provide basic data for in-depth studies of pollution, pollution potential, and the economics of animal waste disposal.

In conjunction with a study of future farm labor demand, estimates will be made of the rate of adoption of farm mechanization and technology by major crop and livestock enterprises from now to 1975 and 1980. Such data are needed to aid farmers, industry, and government in planning for rational allocation of capital in the production process.

A substantial amount of machinery leasing by farm equipment dealers probably occurs in certain areas. A study is planned to determine the extent and economies of farmer-leasing of machinery from equipment dealers in the Corn Belt.

D. Economics of Fertilizer Use and Crop Technology

Economic research on fertilizer is shifting from a major emphasis on production response studies to a more generalized evaluation of the impact of fertilizer on farmers' costs and returns, including analysis of factors affecting demand, customer-dealer relationships, structural characteristics of the fertilizer industry and their relations to farm use of fertilizer.

A project, that is underway, will make an analysis of the supply-demand relationship and price of fertilizer (domestic and export). Also, plans have been made and work started for a periodic "Fertilizer Situation Report" which will include analysis and projection of fertilizer supply, demand, prices, and production capacity, along with special articles on production, consumption or distribution, and a section on exports and others.

Plans are being developed to study the hazards of environmental and water pollution as fertilizer application rates are increased, and to estimate the resulting costs to the Nation.

The publication "Fertilizer Use in the U. S., 1969" will be updated as soon as the 1969 Census of Agriculture data are available. In this publication, fertilizer use by crops will be estimated for 99 areas of the United States.

PUBLICATIONS -- USDA AND COOPERATIVE PROGRAM

A. Economics of Pesticide Use in Agriculture

Carlson, G. A. 1970. A decision theoretic approach to crop disease prediction and control. American Journal of Agr. Econ., Vol. 52, No. 2, pp. 216-223.

Davis, V. W., Fox, A. S., Jenkins, R. P., and Andrilenas, P. A. 1970. Economic consequences of restricting the use of organochlorine insecticides on cotton, corn, peanuts, and tobacco. Agr. Econ. Rpt. No. 168. 52 pp.

Delvo, Herman W., and Anderson, Dale O. 1969. Herbicide use in selected counties, North Dakota, Minnesota, and South Dakota, 1964 and 1966. Agr. Econ. Sta. Series, Issue No. 3, N. Dak. Agr. Expt. Sta. 95 pp.

Eichers, T. R., Andrilenas, Paul A., Blake, Helen T., Jenkins, R. P., and Fox, Austin S. 1970. Quantities of pesticides used by farmers in 1966. Agr. Econ. Rpt. No. 179. 61 pp.

B. Economics of Feed Use and Feed-Livestock Relationships

Allen, George C., and Devers, Margaret. 1970. National and State livestock-feed relationships. Stat. Bul. No. 446. 88 pp.

Elder, William A. 1969. Risks, uncertainty, and futures trading: Implications for hedging decisions of beef cattlefeeders. Minn. Dept. Agr. Econ. No. P69-20. 47 pp.

C. Inventory and Analysis of Production Practices

None.

D. Economics of Fertilizer Use and Crop Technology

None.

AREA NO. 8. FARM COSTS AND RETURNS

Problem. With rapid changes in farming, economic intelligence is needed on representative viable-sized farms in major commercial farming areas. Operators of these units are affected differently and respond differently to changes in economic, institutional and environmental conditions. Data are needed to depict changes in farm organizations and resources, production practices, and prices, and their effects on incomes. Information on the financial structure and changes in financial condition of representative farms also is needed. Such economic intelligence permits analyses useful in formulating farm policies and programs.

U. S. cotton producers are facing strong competition from man-made fibers as well as from foreign-grown cotton. One potential way to improve the competitive position of U. S. cotton is by reducing its cost of production. Extensive surveys and analyses of cotton production costs provide information useful in guiding the Department's special research programs to reduce the cost of producing upland cotton, and also provide the Secretary of Agriculture with cost data for use in establishing the level of price support for cotton.

OBJECTIVES -- USDA AND COOPERATIVE PROGRAM

The program of research on costs and returns by major types of farms is a continuing study of operations on representative, viable commercial farms to determine organization, investment, and debt structure. The studies also analyze annual changes in productivity, receipts, expenses, net farm income, financial condition, physical inputs, farm output, prices received for products sold and prices paid for goods and services used in production. Nearly all the work on costs and returns is done in Washington with informal cooperation with State experiment stations where the studies are located. Formal cooperation is maintained with the New Mexico, Kentucky and Pennsylvania stations.

Cotton cost analysis is a continuing activity designed to measure and analyze changes in the cost of producing upland cotton. Leadership of beltwide surveys of cotton farms is centered in Washington. Aggregative analysis of cotton cost data is done in Washington, and cooperative studies of cotton costs, emphasizing analyses pertaining to particular regions, are conducted in Mississippi, North Carolina, and South Carolina.

PROGRESS -- USDA AND COOPERATIVE PROGRAM

A. Costs and Returns by Major Types of Farms

A review of the costs and returns work was continued at the Division level to further clarify objectives and broaden them to serve additional purposes.

A general framework was established that outlines the concepts, statistical basis and procedures for analysis by type of farm. This framework provides for a sequence of analysis which includes: Costs and returns by types of farms; partitioning returns to the resources used in production; and comparative returns among farms. Costs and returns procedures and concepts were modified to reflect operations of viable farm units that are important contributors to the production of particular commodities. Procedures for partitioning returns to resource categories were also specified.

The partitioning process requires determination of the tenure and debt structure of farms and the allocation of returns to the resource functions of investment, ownership, labor, management and entrepreneurship. It also facilitates analysis of the change in value of resources, e.g., land. Work was continued on a joint study with Pennsylvania State University to establish procedures and guides to measure returns to farmers for comparison with returns in the nonfarm sector.

To expedite the use of viable units in this work certain series were revised and reports prepared, others are in the process of revision. Costs and returns data for 1969 were reported for 21 farms, 6 of which were on a revised basis.

Estimates of costs and returns for 1969 reflected the varying effects of changing economic and environmental conditions on commercial farms of different types. Incomes were higher in 1969 than in 1968 on farms in 5 of 6 type-of-farm groups for which estimates were made. In general, farms producing livestock, poultry or dairy products fared well in 1969. Incomes more than doubled on egg-producing farms in New Jersey chiefly because of higher egg prices. Strong consumer demand for beef was reflected in improved incomes on cattle ranches in the Northern Plains and Rocky Mountain areas, and on tobacco-livestock farms in the Bluegrass area of Kentucky. Broiler farms in Georgia and sheep ranches in Utah-Nevada also benefited from relatively favorable supply-demand conditions. Contract payments to broiler growers averaged higher in 1969 and lamb prices increased substantially. Higher support prices for milk helped to boost incomes on dairy farms in central New York and southeastern Wisconsin. Production, prices, and incomes were higher than in 1968 on tobacco farms in the Coastal Plain of North Carolina but they declined on cotton farms in the High Plains of Texas and the Mississippi Delta.

B. Cotton Cost Analysis

A survey of costs and inputs used in producing the 1969 cotton crop in 16 major cotton-producing regions was completed in April 1970. These data are being subjected to a comprehensive machine edit prior to tabulation. Initial tabulations will consist of costs by input subgroup and by regions. The percentage distribution of production at each of several cost levels will be presented by regions.

A final report on costs of producing upland cotton for 1966 was issued in September 1969. Major results were reported in the FY 1969 Progress Report. The survey data indicate an obvious need to reduce costs as one of several necessary conditions for the future health of the domestic cotton industry. In 1966, for example, only 33 percent of the total crop in the Piedmont, Clay Hills, and Black Belt regions of the Southeast was produced at a direct cost of less than 21 cents per pound of lint (roughly equivalent to an average world market price for U. S. cotton). Yields were below average in 1966, but even during a high-yield year such as 1965 a high proportion of total production was produced at cost levels that would not permit effective price competition with foreign-grown cotton or man-made fibers.

A South Carolina study on the effects of changing cotton production technology on farm organization and income indicates that competitive pricing for cotton is possible through technique improvement. A summary of this research was included in the 1969-70 progress report, and an experiment station bulletin was issued during the first quarter of FY 1970-1971.

An analysis of the effects of alternative cotton program provisions on organization and income of farms in the Southeastern Coastal Plain is nearing completion. The study assumes an above average level of cotton production technology applicable to about a third of the production in the Coastal Plain area. Alternatives considered included the provisions of the cotton program in effect during 1967, 1968, and 1969 as well as some variations of these actual provisions. Also, a "free market" (no Government payments) condition was analyzed. For each major program alternative, the study also analyzed changes in farm organization and income resulting from: (1) Restricting allotment transfers, (2) a \$20,000 payment limitation, (3) restricting the acreage available to a farm, and (4) varying the cotton lint price from 15 to 35 cents a pound.

In the absence of restrictions on allotment transfers, available acreage, or Government payments, the cotton provisions in effect during 1967 resulted in the highest managerial returns. The analysis indicated that firm-capacity acreage of cotton would be grown with each program alternative, except in the organization derived assuming no Government payments, at the lowest cotton price considered. (Firm-capacity acreage is defined as the maximum cotton acreage that can be produced with a specified equipment bundle, i.e., one set of 4-row equipment.) However, higher cotton prices (ranging from \$18.81 to \$29.17 per hundredweight) were required to achieve firm-capacity cotton acreages with restrictions on allotment transfers. In the absence of Government payments a price of approximately \$22.00 per hundredweight was required to generate firm-capacity cotton acreages. A \$20,000 Government payment limitation would result in shifts in farm organization and lower returns to management in the larger farm size group considered. However, the payment limitation would have little effect on the organizations derived for the smaller farm size. The results of this analysis are being prepared for publication.

In North Carolina, preliminary results have been obtained from an analysis of cotton production costs in three subregions of the Southeast. Direct costs of production per pound of cotton were inversely related to yields per harvested acre in all subregions. Returns, including price support payments, on 38 percent of the 1966 cotton crop were less than variable and fixed costs. However, when Federal diversion payments were included in returns to cotton, only about 12 percent of the total 1966 cotton crop in the Southeast was produced at a loss. Attempts are being made to analyze the major determinants of cotton production costs.

Cooperative research in Mississippi emphasized the effects of alternative production systems and practices on the costs of producing cotton. Continuous stubble planting of cotton was found to increase cotton yields during the second and third years of experiments when compared with conventional seedbed preparation. Stubble planting reduced production costs by about \$3.40 per acre. Tests initiated this year will attempt to determine the feasibility of further reductions in seedbed preparation costs by eliminating the use of preplant herbicides. Cotton production systems research was expanded in 1970 to include evaluations of insect control, crop rotations, narrow row plantings, and new harvesting machinery.

C. The Farm Cost Situation

The Annual Outlook Issue of the Farm Cost Situation, summarizing the significant developments and outlook implications in the use and cost of the major farm production inputs was published in February 1970. Further increases in farm production expenses were indicated for 1970, with the increases mainly due to higher prices, although gains in use were expected for a few production inputs. A summary of costs and returns on five selected farm types was included to illustrate the differential impact of the changes in farm costs. Also the effect on costs per acre on six major crop enterprises, operated under a high level of management, were budgeted and discussed.

SERVICE ACTIVITIES

Service activities by the Cotton Cost Analysis Group have involved collaboration with RPDES concerning an evaluation of research expenditures related to cotton. In addition, the Group has collaborated with or supplied information to various groups or individuals charged with responsibilities related to cotton policy questions.

FUTURE PLANS

Continued emphasis will be given to developing type-of-farm series that better depict viable, commercially important types. Increased attention will be devoted to preparation of financial balance sheets for each type of farm. It also is anticipated that methods and procedures developed cooperatively with Pennsylvania State University will be applied to each farm type to measure the relative returns that farm resources would have

earned if invested or used in the nonfarm economy. Other priority areas include analysis of changes in tenure arrangements, changes in the business organization of farms, and changes in the incidence of off-farm income.

The tabulation and analysis of results from the 1969 cotton cost survey is of highest priority in FY 1971 for the Washington staff of the Cotton Cost Analysis Group. Concurrently, more emphasis will be placed on the quantification of the various input components of major importance in determining the levels and variability of production costs. The major components of cost will be analyzed to ascertain whether there are important cost reduction possibilities. Another important research question relates to the optimum location of cotton production, and the policy alternatives that would allow or promote the most efficient use of resources in cotton production. Such analyses will have a primary objective of providing information useful at the policy level.

PUBLICATIONS -- USDA AND COOPERATIVE PROGRAM

A. Costs and Returns by Major Types of Farms

Cummins, David E. and Robinson, Margaret I. 1969. Costs and returns commercial grade A dairy farms, Southeastern Wisconsin and Central New York, 1968. FCR-68. 10 pp.

Evans, J. Albert and Nolan, Dorothy. 1969. Costs and returns commercial cotton farms, Mississippi Delta, 1968. FCR-66. 6 pp.

Goodsell, Wylie D., Latimer, Robert G., and Tippet, Daphene E. 1969. Costs and returns commercial egg-producing farms, New Jersey, 1968. FCR-64. 5 pp.

Goodsell, Wylie D., Gray, James R., and Belfield, Macie J. 1969. Costs and returns western livestock ranches, 1968. FCR-65. 15 pp.

Goodsell, Wylie D., Shugars, Owen K., and Tippet, Daphene E. 1969. Costs and returns commercial broiler farms, Georgia, 1968. FCR-67. 4 pp.

Goodsell, Wylie D. and others. 1969. Farm costs and returns, commercial farms by type, size and location 1969. AIB-230 (revised). 23 pp.

Goodsell, Wylie D., Latimer, Robert G., and Tippet, Daphene E. 1970. Costs and returns commercial egg-producing farms, New Jersey, 1969. FCR-72. 5 pp.

Goodsell, Wylie D. and Belfield, Macie J. 1970. Costs and returns northwest cattle ranches, 1969. FCR-73. 9 pp.

Goodsell, Wylie D., Shugars, Owen K., and Tippet, Daphene E. 1970. Costs and returns commercial broiler farms, Georgia, 1969. FCR-74. 5 pp.

Shugars, Owen K., Bondurant, John H., Keller, Luther H., and Tippet, Daphene E. 1969. Costs and returns commercial tobacco-livestock farms, bluegrass area, Kentucky and Pennyroyal Area, Kentucky-Tennessee, 1968. FCR-70. 11 pp.

Shugars, Owen K. and Tippet, Daphene E. 1969. Costs and returns commercial tobacco farms, Coastal Plains, North Carolina, 1968. FCR-69. 5 pp.

Shugars, Owen K. and Tippet, Daphene E. 1970. Costs and returns commercial tobacco farms, Coastal Plains, North Carolina, 1969. FCR-75. 5 pp.

Strand, Edwin G. and Jenkins, Isabel. 1969. Costs and returns commercial corn belt farms, 1968. FCR-71. 14 pp.

Weisgerber, P. and Robinson, Margaret I. 1969. Costs and returns commercial wheat farms, Pacific Northwest, Northern Plains, and Southern Plains, 1968. FCR-63. 9 pp.

B. Cotton Cost Analysis

Robinson, B. H., Butler, C. P., and Hubbard, J. W. 1969. The effects of changing cotton production technology on farm organization and income, Upper Coastal Plain, South Carolina. S. C. Agr. Expt. Sta. Bul. No. 546. 55 pp.

Starbird, I. R. and French, B. L. 1969. 1966 supplement to costs of producing upland cotton in the United States, 1964. 1966 Supplement to Agr. Econ. Rpt. No. 99. 42 pp.

C. The Farm Cost Situation

Economic Research Service. 1970. The farm cost situation. 1970 outlook issue. FCS-41. 41 pp.

AREA NO. 9. FARM LABOR UTILIZATION AND PRODUCTIVITY

Problem. Utilization of human effort in farm production has changed greatly in recent decades and is likely to change even more in the years to come. Technological and other economic developments increase the productivity of individual workers and make possible a decrease in the number of persons engaged in farmwork. But these developments require higher levels of skill and knowledge on the part of persons continuing to do farmwork. At the same time, increasing attractiveness of nonfarm jobs together with various social and economic changes exert upward pressures on earnings and perquisites in many types of farm employment. Many economic, social, and other changes affect utilization of human effort in farm production. A better understanding of these changes is needed to assist in planning and guiding the human and economic adjustments involved.

OBJECTIVES -- USDA AND COOPERATIVE PROGRAM

Work on farm labor inputs is carried on as a continuing program aimed at keeping abreast of farm labor used nationally and by regions, and major enterprises. Annual estimates of man-hours of farmwork are based on pertinent secondary data and, when necessary, field surveys. This series of estimates goes back to 1910, and gives a comprehensive statistical picture of what has happened to farm labor inputs in this century.

A continuing program of research on farm labor productivity and efficiency is conducted. It provides annual indexes of farm production per man-hour, with breakdowns by regions and by major commodities. The series of estimates provide measures of farm labor productivity over the years. Periodic analyses show past and projected future effects of technological and other developments on production per man-hour and on quantity of labor used.

Continuing studies bring out the effects of rising labor costs on labor demand, farm production, rate of adoption of new technology, and changing structure of agriculture. Unit farm labor costs are increasing rapidly as the result of a number of factors. These include Federal legislation on minimum wages and social security, and some State legislation on such things as workmen's compensation, unemployment insurance, and make-up pay. Another factor is increased competition for workers from the nonfarm sector as the economy operates at nearly full employment. Then too, rising skill levels are needed by farmworkers to operate more complex labor-saving equipment. Higher perquisites and incentive payments, and attempts to reduce seasonal employment to provide more continuous work periods also have been major contributors to rising unit costs of farm labor. Current research includes nationwide surveys of labor and related data by such farm characteristics as type, size, and economic class.

Cooperative research is carried on with the California, Maine, Michigan, Minnesota, Purdue, Washington, and Wisconsin Agricultural Experiment Stations.

PROGRESS -- USDA AND COOPERATIVE PROGRAM

A. Farm Labor Requirements and Use

The continuing research on man-hours of farmwork in farm production indicated that labor used on U. S. farms in 1969 reached a new low of 6.9 billion man-hours, 2 percent less than in 1968. Labor used for all crops remained at the 1968 level, although man-hour use increased on hay and forage, fruits and nuts, sugar crops, cotton, and tobacco. There were substantial gains in production of fruits and nuts, sugar crops, and tobacco.

Man-hours for farmwork declined in all regions except the Southeast, Southern Plains, and Mountain. The greatest decrease occurred in the Corn Belt Region, 6 percent. In the Northeast and Lake States, hours used dropped 4 and 5 percent. Reduced farm output, both livestock and crop, in the Corn Belt and Lake States, accounted for the substantial decreases in labor.

A manuscript, "Seasonal Demand for Family Labor," presenting data from the 1966 Pesticide and General Farm Survey is being revised. Little family labor was used on row crop and fruit farms during the off-season, but there were dramatic increases in labor use during harvest peaks. Dairy and other livestock operations used a more nearly constant flow of labor all year with smaller adjustments to peak summer hours. Crop harvest occurs earlier in the South than in the Northeast and mid-West, causing earlier peak labor needs. The peak work month differed among the various family members. The operator's peak was during planting, farrowing or harvesting; the wife worked most in early spring or in late fall, while the other family members' peak work month was July.

B. Farm Labor Productivity and Efficiency

The continuing research on farm labor productivity and efficiency shows that 1969 farm output per man-hour maintained its upward trend by rising 4 percent above the 1968 level. The gain in livestock production per hour greatly exceeded that for crops -- 6 percent as compared with less than 1 percent. Increases of 7 percent were registered for milk cows and poultry while meat animals showed a 4 percent rise in output per hour. There were labor-saving gains in all crop groups except cotton and tobacco. Increases ranged from 16 percent for fruits and nuts to 1 percent for vegetables. Output per hour on cotton declined 11 percent and reflects a 16 percent decrease in yield on increased acreage. Production per hour rose in eight farm production regions, but declined in the Delta States and Southern Plains because of the influence of the poor cotton crop.

Farm employment declined to 4.6 million workers in 1969, and each worker, on the average, produced enough food, fiber, and other farm products to supply himself and 44 other consumers. In 1960, each farmworker produced enough farm products for himself and 25 other consumers. Most of the consumers were U. S. residents, but in 1969, about 14 percent were citizens of foreign countries who were supplied through exports from this country. Greater application of modern technology both on and off the farm, and the transfer of some jobs from farm to nonfarmworkers permitted the gain in persons supplied per farmworker.

C. Economics of Farm Labor Utilization

A manuscript, "Cash Wages and Perquisites Received by Regular Hired Farmworkers, 1966," presenting labor data from the 1966 Pesticide and General Farm Survey, is being reviewed. Wages for regular workers provided perquisites were 46 percent higher than for those who received only cash -- \$3,571 as compared with \$2,450. Wages varied by type of farm with workers on general, fruit and nut, vegetable, and livestock farms being paid the most. About half the regular workers were furnished a house which was valued at \$572 a year.

A manuscript, "Methods of Hiring Seasonal Farm Labor" has been prepared. Major users of contract or crew labor were Southeast fruit farms with sales of \$10,000 and over. A greater proportion of tobacco farmers than any other kind personally hired and supervised their seasonal workers. But the most hours of seasonal labor per farm hired directly by the operator was that used on large-scale Pacific vegetable farms. Regionally, farmers in the mid-Continent (Northern Plains, Southern Plains, and Mountain Regions) generally relied on contract crew workers while Northeastern and Southern farmers personally hired and paid their seasonal workers. Small (less than \$5,000 sales) cash grain and livestock farms were more likely to use contract or crew labor than similar large farms. This was probably for custom combining. On cotton and tobacco farms use of crew labor was greatest on the largest farms (sales of \$40,000 and over).

A manuscript, "Family and Hired Labor Used on U. S. Farms in 1966," presenting detailed labor data from the 1966 Pesticide and General Farm Survey is being reviewed. Over half of the small farms (less than \$2,500 sales) used only family labor while only 6 percent of farms with \$100,000 or more in sales operated with just family labor. The operator and his family put in as few as 1,500 hours annually on Southeast cotton farms while the average Northeast and Lake States dairy farm used about 5,500 hours of family labor during the year. There is a great difference in labor utilization not only by farm type, but also among similar size and type of farms in different geographic areas. Tobacco farmers used only 3,625 hours of annual labor with 18 percent of it hired, as compared with 7,600 hours by vegetable farmers with 63 percent of it hired. Northeast dairy farms used 7,400 hours, only a fourth hired, whereas Southeast dairy farms used over 12,200 hours of labor with two-thirds of it hired.

A manuscript, "Farm Work Week," presenting data from the 1966 Pesticide and General Farm Survey is being reviewed. Length of work week was found to vary with size and type of farm and production region. Weekly hours worked by farm operators ranged from 22 hours on small farms to 61 hours on farms with \$20,000 to \$39,999 sales. Farm operators who hired labor worked 8 hours per week more than nonhiring operators. Family members on Northeast and Lake States dairy farms worked more than twice as many hours per week as did those who worked on southeast cotton farms. Regular hired workers averaged less than a 40-hour work week only on tobacco and poultry farms. Those who worked on farms in the North worked 10 to 11 hours more per week than regular hired workers did on farms in the South.

A manuscript, "Hired Farm Labor Patterns and Prospects," is being reviewed. Hired labor use on farms varies by size and type of farm and technology used. Effects of increasing wage rates from those paid in 1966 which averaged \$1.33 to \$1.45, \$1.60, \$1.75, and \$2.00 per hour on farm wage expenditures and the level of hired employment are considered by type and size of farm. At the \$2.00 rate, shortrun employment would decrease by 10 percent and the wage bill would increase 35 percent, assuming the shortrun elasticity of demand for labor at -0.2. In the longrun situation, unit elasticity is assumed and at \$2.00 per hour employment would decrease by 33 percent.

A manuscript, "Hired Farmworkers Receiving Perquisites," is being reviewed. Regular hired workers who received perquisites were classified by major activity as: (1) Tractor and machinery operators, (2) field hands, (3) dairy hands, (4) poultry hands, (5) livestock workers, and (6) general farmworkers. For each category, hours worked, annual wages, and rate per hour were determined by five methods of payment: (1) Year, (2) month, (3) week, (4) day, and (5) hour. The 1966 average for all workers was \$3,568 or \$1.53 per hour including perquisites. Tractor and machine operators and field hands received the lowest wages and poultry hands and general farmworkers the highest wages. Dairy hands received the lowest hourly wage (\$1.25), but worked the most hours so that annual wages averaged \$3,272.

Phase 1 of a cooperative study with the Maine Experiment Station has been completed. This analyzes the economic impacts of a changing labor force in Aroostook County. This phase examined the effects of harvest mechanization on potato farm organization. With handpicking labor valued at \$1.50 per hour, the cost of replacing an hour of labor with machines at 75 acres, was \$1.61; at 125 acres, \$1.49; and at 250 acres, \$1.48. Thus, no substantial savings occur as machines replace labor. However, fewer labor problems are encountered, and as wage rates go up, the harvesting of potatoes by machine becomes relatively more advantageous.

Preliminary work has started on phase 2, which examines the impact on the local economy of a significant shift from a large hand harvest work force to a small machine operator force.

In cooperation with the Washington Experiment Station, a project to study the demand for labor on Washington fruit and vegetable farms was continued. A preliminary manuscript on the "Economics of Asparagus Production and Harvest Mechanization" was reviewed. The data showed that the optimal life of asparagus beds is 17 years for hand harvested beds and 16 years for beds machine harvested. Budgets show that asparagus prices would have to double before growers could mechanize and receive the same net returns from a typical 20 acre bed as with hand harvest methods. Thus, early adoption of mechanical harvesting of Washington asparagus appears unlikely.

In a cooperative study with the Iowa Experiment Station, a survey of labor used on large commercial hog farms in eastern Iowa is being analyzed. Preliminary results indicate that sources and amounts of payments to full-time farm employees vary significantly by age, education, and marital status. Perquisites make up 24 percent of the full-time workers' total pay. Those in the higher skill category received over \$1,000 more than those with low skill levels. Married employees averaged over \$1,300 more than single employees. Pay was higher for the middle-age groups than for younger or older workers. Other important variables influencing wages included distance to nearest large town, education of employees, education of employers, size of hog operation and ratio of man-months of hired labor to operator and family labor.

Research has been initiated in California on the economic effects of rising labor costs resulting from factors such as unionization, minimum wage increases, and unemployment insurance on the production of labor-intensive crops. A field survey of cling peach producers is planned. Capital-labor substitution will be studied and models of different production technologies will be prepared and evaluated.

A study of dairy production practices, labor, and technologies used in the Lake States -- Michigan, Wisconsin, and Minnesota -- resulted in projections of total labor needs in Lake States dairy farming for 1975 and 1980. The Markov chain technique used takes into account past changes in numbers and sizes of dairy herds and the adoption of labor-saving technology.

By 1980 an estimated 84,000 farm operators and their families will be involved in dairy production, 60,000 fewer than in 1967. Labor for feeding, caring for, and milking dairy cows in the Lake States is expected to decline from 3.1 million hours in 1967 to 2.2 million hours in 1980. Labor per cow is expected to decline from 93 to 83 hours, and per cwt. of milk from 0.92 to 0.69 hours over the period.

Results from a dairy technology survey in 1968 were used to evaluate the impact of higher manufacturing milk standards in Minnesota. Cost per cwt. of milk, assuming 10,000 pounds of milk per cow per year, could increase as much as \$2.68 for herds with 10 cows and \$1.09 for herds with 30 cows under proposed higher standards.

A dairy farm equipped with labor-saving technology has been synthesized to study the economics of using hired labor on large dairy farms.

Costs and returns for Wisconsin dairy farmers were analyzed from the USDA series and from detailed records of the Wisconsin Electronic Farm Records Program. Labor earnings on two-man dairy farms were analyzed from records of 154 farms with herds larger than 55 cows. After computing wages for family labor and 6 percent return on total capital, labor income was \$12,560 or \$5,815 per year per full-time man. These farms averaged 76 cows, 323 crop acres, and had an investment of \$214,000 per farm.

In conjunction with the regional labor project, preliminary work projecting the demand for labor on Wisconsin dairy farms to 1980 was completed.

Preliminary results indicate that by 1980 nearly all of Wisconsin's milk will be grade A and be shipped bulk. With the major proportion of cows then in herds of over 40 cows, and with greater mechanization, a considerable decline in dairy labor will result.

A project continues in cooperation with Purdue University on the impact of technological change on the demand for, and use of, farm labor, with special reference to factor returns and to labor skills needed in farming. A manuscript was prepared and is being reviewed. Projections of changes in the productivity of agricultural resources were analyzed for use in projecting the demand for and use of farm labor. This investigation considered the following: (1) Labor demand determinants accounted for in the productivity measures developed in earlier phases of the research, (2) errors in projecting the productivity measures, and (3) random and specification errors in the demand equations derived from the estimated production functions. Preliminary empirical results on the relative importance of technical and price determination of U. S. farm labor use were developed for the period 1910 to 1966. These results are available for use in developing farm labor use projections under various product-factor market conditions. The following limitations in the use of these results were suggested by the analysis of errors in the derived demand equations: (1) The production function-derived demand approach inherent in aggregate productivity measurement does not account for the simultaneous determination of labor use by technical and price factors, and (2) the effects of specific determinants of productivity change are unidentified, restricting the possibilities for improving the specification of the demand equations.

SERVICE ACTIVITIES

The prospect of rapidly mechanizing sugarbeets, cherries and a number of other crops brought concern to the Senate and the Department of Health, Education and Welfare that many thousands of migratory workers would be unemployed in 1970. An administrative report prepared in ERS from published and unpublished data from ASCS, SRS, and ERS, indicated the potential employment prospects for migrants in the mid-Continent Migrant Stream. It also

evaluated several proposals for aiding migrants including educational grants and land redistribution schemes.

The Labor Subcommittee of the Northeast Regional Farm Management Committee is engaged in an area-wide survey of farm operators and employers regarding feasibility and estimated cost of providing unemployment insurance to farmworkers. ERS has devoted considerable time to this project in questionnaire development and sampling procedures.

Numerous letters on unionization, minimum wage, unemployment insurance and other labor problems were prepared for the Secretary or the Administrator of the Economic Research Service.

FUTURE PLANS

The Congress is considering several bills to permit agricultural employees to bargain collectively with employers. Collective bargaining by farmworkers may have serious implications for producers of labor-intensive crops, for the workers involved, and for consumers. Fruits and vegetables, particularly those harvested for the fresh market, are difficult to mechanize, and quality of product declines rapidly if harvest is delayed. They require large amounts of seasonal labor for relatively short periods of time.

A study similar to the one initiated in California is planned for Florida. This would study the economic effects of rising labor costs due to unionization, minimum wage increases, and unemployment insurance on production of citrus and labor-intensive winter vegetable crops.

Further analyses of labor, machinery, and other input data in the 1966 Pesticide and General Farm Survey is planned. These will be combined with data from the 1965-66 sample Census survey on farm labor.

Labor input data will be obtained on the mechanization and farm practices surveys conducted periodically in cooperation with SRS. These data aid in maintenance of the series of man-hours of farmwork and permit analysis of capital-labor substitution in enterprises on an aggregate basis.

A study of future mechanization and demand for farm labor will be expanded. This work will be coordinated with the ERS projections on acreage, production and yield and will focus on the years 1975 and 1980. It will utilize existing projections such as those for fruits, vegetables, and tobacco, in the development of overall projections of labor and mechanization of agriculture by major enterprise groupings.

Analysis and publication of findings of labor demand on Corn Belt livestock farms will continue. Findings related to sociological conditions, pay packages, and skill level of hired workers will be released first. Other data on type and size of farm, hog and crop mechanization levels, and farm plans for 1975 will be used in linear programming analyses.

Effects of uncertainty of weather during the Maine potato harvest period on equipment complement and labor use will be completed. Also, an economic analysis of new technology -- the air-vac potato harvester -- will be completed. This technology will improve potato quality and potentially will halve the labor input currently associated with mechanical harvesting. Phase 2 of the study will concentrate on the impact on the local economy of a substantial shift from a large hand harvest work force to a small force of machine operators and helpers.

PUBLICATIONS -- USDA AND COOPERATIVE PROGRAM

A. Farm Labor Requirements and Use

Farm Production Economics Division. 1969. Man-hours of labor used for farmwork, by groups of livestock and crops, for each farm production region, 1950-68. Stat. Bul. 233, Supp. III. 12 pp.

McElroy, R. C., EDD; Gavett, E. E., and Shugars, O. K., FPED; and Reimund, D., MED. 1969. Potential mechanization in the flue-cured tobacco industry with emphasis on human resource adjustment. Agr. Econ. Rpt. No. 169. 74 pp.

Sellers, Walter E. 1970. Labor used on U. S. farms, 1964 and 1966. Stat. Bul. No. 456. 24 pp.

B. Farm Labor Productivity and Efficiency

Farm Production Economics Division. 1970. Changes in farm production and efficiency. Stat. Bul. 233, revised. 17 pp.

Farm Production Economics Division. 1969. Index numbers of farm production per man-hour, by groups of livestock and crops, for each farm production region, 1950-68. Stat. Bul. 233, Supp. IV. 12 pp.

C. Economics of Farm Labor Utilization

Buxton, Boyd M. 1970. Farms reporting dairy sales in 1964 -- selected characteristics. Econ. Res. Serv. Rpt. No. 445. 24 pp.

Kimball, N. D. and Saupe, W. E. 1969. Labor earnings on two-man dairy farms. Managing the farm. Wisconsin Agr. Econ. Dept., Vol. 2, No. 5. 4 pp.

Kimball, N. D. and Saupe, W. E. 1970. Costs of producing milk on selected Wisconsin dairy farms. Wisconsin Agr. Coll. No. 61. 9 pp.

Micka, E. S. and Krofta, R. N. 1970. Economic impacts of a changing labor force in Aroostook County, Maine. Phase 1: Effects on potato farm organization. Maine Agr. Expt. Sta. Bul. No. 681. 32 pp.

Smith, R. B. and Heady, E. O. 1970. Paradox of farm labor. Iowa Farm Science, Vol. 24, No. 12, pp. 639-64.

AREAS NEEDING CRITICAL RESEARCH ATTENTION

There are several areas of work for which the Division had, at most, minor programs in FY 1970 but whose increasing importance warrants the expansion of active research efforts in the immediate future. Among them are the following:

A. Subsector Analysis for Major Farm Commodities

Decisionmaking for a number of major farm commodities spans the full range from the supplying of production inputs at the one end to the merchandising of food and/or fiber products at the other. As a result, it is no longer possible to identify many decisions as being those solely related to production, marketing, or distribution. Thus, in order to provide the best economic intelligence possible, it is increasingly important to conduct research with as broad a vertical range as the questions faced by decision-makers. Examples of farm commodities for which industrywide decisions have important implications include those of the pork-swine industry, the beef cattle industry, and a number of fruit and vegetable products. A subsector study of the pork-swine industry is being initiated in cooperation with Marketing Economics Division, Purdue University and Michigan State University. This research will span the entire range between the supplying of production inputs to the retailing of pork products. If this procedure appears successful, similar research should be undertaken for several other farm commodities.

Also, as farming becomes more specialized, we need to place less emphasis on the "whole-farm" concept and more emphasis on specific commodities. Specialization emphasizes single-product operation and the subcontracting of particular functions such as fertilizing, pesticide applications, custom harvesting, etc. Such commodity analyses will be concerned with (a) structure (number and size of firms), (b) cost structure (unit costs of what proportion of the firms and of the total output), (c) the ownership of resources used by the commodity sector, and (d) the proportion of internal-external investment of the commodity sector. This work should be coordinated with the commodity work of MED and ESAD.

Indication of a need for commodity analysis does not suggest that the importance of production of several commodities by "conglomerate firms" should be overlooked. Even within such conglomerates, however, commodity production is likely to be quite specialized and unlike the production of several commodities on the "general farm" of the past.

B. Distribution of Benefits from Government Programs

Past research relating to Government programs in agriculture has dealt primarily with the supply, price, and income implications of alternative programs. A topic of increasing importance to policymakers and others concerned

with evaluation of farm programs is the distribution of program benefits. Of particular interest is the need to relate program benefits to different target groups determined by such criteria as age, total income including off-farm income, and farm income. In some cases, a particular need is the allocation of program benefits to farmers in a "commercial farming" situation as distinct from benefits realized by farmers who do not reasonably fall into the "commercial farming" category. Such analyses should be designed to provide answers to questions such as what the likely distribution of program benefits, as well as the impact on supply response, prices, and farm income, would be as limitations are set on the amount of program payments that can go to any individual.

C. Farm Production Practices and Environmental Quality

An increasing number of policy questions refer to relationships between environmental quality and farm production activities. These include the effects of fertilizers, pesticides, and animal wastes on the environment, and the potential impact of restrictions on pollutants in terms of productivity, costs, and location of farm production. Development of modern commercial agriculture has involved the use of increasing quantities of pesticides and fertilizers. Large feedlots, dairy operations, and swine production activities produce livestock waste materials in increasingly concentrated amounts. Thus, it appears important to obtain improved measures of the quantity and distribution of key production factors, particularly chemical pesticides and fertilizers, and of waste products, especially those associated with the production of livestock and livestock products. Studies at the micro and macro level are also urgently needed to define relationships between these materials and environmental quality and to assess the impact of controlling pollution associated with crop and livestock production.

D. Returns to Resources Employed in Farming

Traditional analyses of farm income have viewed the farmer as the full owner and supplier of production resources. Thus, farm income and returns to resources were synonymous. Increasingly the functions of resource ownership, investment, and entrepreneurship are being performed by different role players. Returns to farming may consist of rents to landlords, interest to mortgage holders, wages to workers and entrepreneurial profits to operator-managers. Recipients of returns from farming, along with lending institutions, officials involved in farm policies and programs, and others, are interested not only in the distribution of returns but also in the relative level of returns to resources used in farming compared with other sectors of the economy. Conceptual and analytic tools are available for measuring returns, and procedures are being developed to facilitate comparison of returns to resources used in farming with other sectors. As appropriate, these techniques should be employed in our farm-firm analyses (size and type situations).

CRIS RESEARCH WORK UNITS

AREA NO. 1. AGRICULTURAL ADJUSTMENTS

| <u>CRIS No.</u> | <u>Title</u> |
|-----------------|---|
| FE 9-5-03-01 | Economics of adjustments in beef production in the Southwest |
| FE 9-5-06-01 | Economics of adjustments in beef production in the Mountain States |
| FE 9-5-14-01 | Economic appraisal of the beef production industry in the Corn Belt and Lake States |
| FE 9-5-28-01 | Economics of beef production in the Corn Belt States |
| FE 9-5-28-01-XI | Economics of adjustments in beef and swine production in the U. S. |
| FE 9-5-35-01 | Economic appraisal of beef cattle production in the Southeast |
| FE 9-5-39-01 | Economics of beef production in the Northwest |
| FE 9-5-43-01 | Evaluation of the beef production industry in the South |
| FE 9-7-05-08 | Adjustments in cotton production in California |
| FE 9-9-04-01 | Adjustment opportunities in the rice areas of Arkansas and adjoining States |
| FE 9-9-05-08 | Economic appraisal of adjustment opportunities in California rice producing areas |
| FE 9-9-19-01 | Adjustment opportunities in the rice areas of Louisiana and adjoining States |
| FE 9-9-25-05 | Adjustment opportunities in the rice areas of Mississippi and adjoining States |
| FE 9-9-46-01 | Adjustment opportunities in the rice areas of Texas and adjoining States |

| <u>CRIS No.</u> | <u>Title</u> |
|------------------|--|
| FE 9-16-07-01-XI | Dairy adjustments and supply response in Connecticut and other Northeastern States |
| FE 9-16-09-01-XI | Dairy adjustments and supply responses in Delaware and other Northeastern States |
| FE 9-16-20-01 | Adjustments in dairy farming in Maine and other Northeastern States |
| FE 9-16-21-01-XI | Dairy adjustments and supply response in Maryland and other Northeastern States |
| FE 9-16-33-01 | Adjustments in dairy farming in New York and other Northeastern States |
| FE 9-16-40-01-XI | Adjustments in dairy farming in Pennsylvania and other Northeastern States |
| FE 9-16-48-01-XI | Dairy adjustments and supply responses for milk and milk products in Vermont and other Northeastern States |
| FE 9-19-17-01 | Effects of varying structural detail of farms and areas on aggregate response estimates |
| FE 9-23-17-01 | Adjustments on wheat farms in Kansas and adjoining States |
| FE 9-24-13-01-XI | Adjustments on wheat farms in Idaho |
| FE 9-28-15-01 | Effects of changing substitution relationships on regional equilibrium and adjustments in soybean production |
| FE 9-29-18-01 | Effect of alternative burley tobacco programs on incomes of growers and allotment owners |
| FE 9-30-05-08 | Adjustments on range-livestock ranches in California and other Western States |
| FE 9-30-06-01 | Adjustments on range-livestock ranches in Colorado and other Western States |
| FE 9-30-46-01 | Adjustments on range-livestock ranches in Texas and other Western States |

| <u>CRIS No.</u> | <u>Title</u> |
|------------------|--|
| FE 9-31-05-08-XI | Evaluation of land costs associated with cotton production in California |
| FE 9-32-05-08 | Effects of supply and quality of irrigation water on agricultural production in California |
| FE 9-32-38-01 | Growth and survival strategies of farm firms in the Southern Great Plains |
| FE 9-32-46-01 | The effect of a declining water supply in Texas high plains |
| FE 9-33-49-01 | Analysis of the Virginia-North Carolina peanut production sector |
| FE 9-34-19-01 | Economics of farm organization and size in the Mississippi River Delta |
| FE 9-34-25-05 | Economics of farm organization, size, and systems of production in the Delta area of Mississippi |
| FE 9-35-27-01 | Aggregate economic analysis of range livestock production in Montana and other Western States |
| FE 9-35-39-01 | Aggregate economic analysis of range livestock production in Oregon and the Pacific Northwest |
| FE 9-35-46-01 | Economic appraisal of beef cattle production in Texas and the Southwest |
| FE 9-36-30-01 | Economic impacts of alternative future structures of the dairy industry |

AREA NO. 2. PRODUCTION RESPONSE AND FARM
PROGRAM APPRAISAL

| | |
|---------------|---|
| FE 9-14-16-1 | Adjustments in Corn Belt farming |
| FE 9-18-38-01 | Economics of production control programs in the South Central region |
| FE 9-18-54-00 | Economics of production control programs in the United States |
| FE 9-19-03-01 | Analysis of agricultural production response to economic forces in Arizona and other Southwest States |

| <u>CRIS No.</u> | <u>Title</u> |
|-----------------|--|
| FE 9-19-06-01 | Analysis of agricultural production response to economic forces in Colorado and other Great Plains States |
| FE 9-19-11-06 | Analysis of agricultural production response to economic forces in Georgia and other Southeast States |
| FE 9-19-16-01 | Analysis of agricultural production response to economic forces in Iowa and other North Central States |
| FE 9-19-38-01 | Analysis of agricultural production response to economic forces in Oklahoma and other South Central States |
| FE 9-19-50-01 | Analysis of agricultural production response to economic forces in Washington and other Pacific Northwest States |
| FE 9-19-54-00 | Analysis of agricultural production response to economic forces |
| FE 13-3-39-01 | Econometric analyses of the effects of weather and technology on crops in the Pacific Northwest |
| FE 13-3-54-00 | Influence of weather on crop yields and production |
| FE 13-4-05-08 | Projection of cropping patterns and land use |
| FE 13-4-54-00 | Appraisal of farm production prospects and resource needs |
| FE 13-5-54-00 | Measurement and analyses of farm output and resources used |

AREA NO. 3. STRUCTURE OF AGRICULTURE AND
ECONOMICS OF FARM SIZE

| | |
|------------------|---|
| FE 1-10-23-01-XI | Financial management of large scale farm firms |
| FE 10-2-54-00 | Classification and analysis of kinds and sizes of farms |

CRIS No.

Title

AREA NO. 4. FARM CAPITAL, CREDIT AND
FINANCIAL CONDITION

| | |
|---------------|--|
| FE 1-11-54-00 | Farm credit statistics and analysis of trends |
| FE 1-12-14-01 | Analysis of flows of funds for the farm sector |
| FE 1-12-26-01 | Changes in financial structure of agriculture in Missouri |
| FE 1-12-54-00 | Changes in financial structure of agriculture |
| FE 1-13-54-00 | Factors affecting cost, terms, and availability of credit for farmers |
| FE 3-4-27-01 | Crop production risks in the Great Plains area |
| FE 3-5-54-00 | Measurement and analysis of farm risks, losses, and insurance |

AREA NO. 5. AGRICULTURAL RISKS AND INSURANCE

| | |
|------------------|---|
| FE 1-10-10-01 | Financial management of farm firms in the Southeast |
| FE 1-10-15-01 | Financial management of farm firms in Indiana and adjoining States |
| FE 1-10-17-01 | Growth of farm firms in the Great Plains and their adaptation to risk and uncertainty |
| FE 1-10-23-01 | Financial management of farm firms in the Great Lakes region |
| FE 1-10-39-01-XI | Socio-cultural factors in financial management strategies of western range livestock producers |
| FE 1-10-50-01 | Financial management of farm firms in the Northwest |
| FE 1-10-54-00 | Financial management of farm firms in the United States |
| FE 1-12-23-01 | Financial farming operations in the Eastern Corn Belt in 1980 |
| FE 1-13-15-01 | Financing the acquisition of machine services for farm production in the Midwest |

| <u>CRIS No.</u> | <u>Title</u> |
|--|---|
| FE 1-13-33-01 | Financing the acquisition of farm production resources in the Northeast |
| AREA NO. 6. FARMLAND VALUES AND VALUATION | |
| FE 2-1-28-01 | Current developments in the farm real estate situation in the Corn Belt |
| FE 2-1-39-01 | Rural land price determination in selected areas of Oregon |
| FE 2-1-54-00 | Current developments in the farm real estate situation |
| FE 2-2-54-00 | Annual estimates of farm real estate rentals |
| AREA NO. 7. ECONOMICS OF FARM PRACTICES AND TECHNOLOGY | |
| FE 12-1-54-00 | Measurement and analysis of progress in farm mechanization |
| FE 12-2-54-00 | Use of selected farm production practices in the U. S. |
| FE 12-3-54-00 | Annual feed consumption by class and species of livestock |
| FE 12-6-54-00 | Interpretation of yield responses to fertilizer |
| FE 12-7-06-01-XI | Appraisal of structure and change in the nitrogen industry and its effect on farm firms |
| FE 12-7-14-01 | Economic analysis and projection of regional fertilizer demand relationships |
| FE 12-13-54-00 | Changing agricultural chemical industry and its coordination with farms |
| FE 12-7-54-00 | Farm demand for fertilizer, machinery, and structures |
| FE 12-10-28-01 | Economic evaluation of pesticide use in Nebraska and other North Central States |
| FE 12-10-54-00 | Economics of pesticide use in the agriculture of the U. S. |

| <u>CRIS No.</u> | <u>Title</u> |
|--|---|
| FE 12-12-14-01 | Structural changes in the hog-feed industry in Illinois |
| FE 12-12-24-01 | The economic role of beef cattle futures |
| FE 12-12-54-00 | Structural changes in the livestock-feed industry |
| AREA NO. 8. FARM COSTS AND RETURNS | |
| FE 9-30-32-07-XI | Economic characteristics of commercial cattle ranches in New Mexico and the Southwest |
| FE 9-31-11-01 | Cost of producing cotton in Georgia and adjoining States |
| FE 9-31-35-01 | Analysis of the cost of producing cotton in the Southeast |
| FE 9-31-43-01 | Cost of producing cotton in South Carolina and adjoining States |
| FE 9-31-45-01 | Cost of producing cotton in Tennessee and adjoining States |
| FE 9-31-54-00 | Cost of producing cotton in the United States |
| FE 14-1-40-01-XI | Comparative resource returns on costs and returns farms |
| FE 14-1-54-00 | Costs and returns on family-operated farms by type and size |
| FE 14-2-54-00 | Preparation of farm cost situation annual reports |
| AREA NO. 9. FARM LABOR UTILIZATION AND PRODUCTIVITY | |
| FE 11-3-05-08 | Economics of capital-labor substitution on California fruit and vegetable farms |
| FE 11-6-54-00 | Labor requirements and productivity in U. S. agriculture |
| FE 11-7-16-01 | Labor use in selected crops and livestock in the Corn Belt |

| <u>CRIS No.</u> | <u>Title</u> |
|-----------------|--|
| FE 11-7-20-01 | Labor use in selected crops and livestock in the Northeast |
| FE 11-7-23-01 | Labor use in selected crops and livestock in the Lake States |
| FE 11-7-24-01 | Labor and capital use in dairy farming in Minnesota |
| FE 11-7-50-01 | Labor use in selected crops and livestock in the Pacific Northwest |
| FE 11-7-52-01 | Labor and capital use in dairy farming in Wisconsin |
| FE 11-8-15-01 | Demand for and use of farm labor |

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